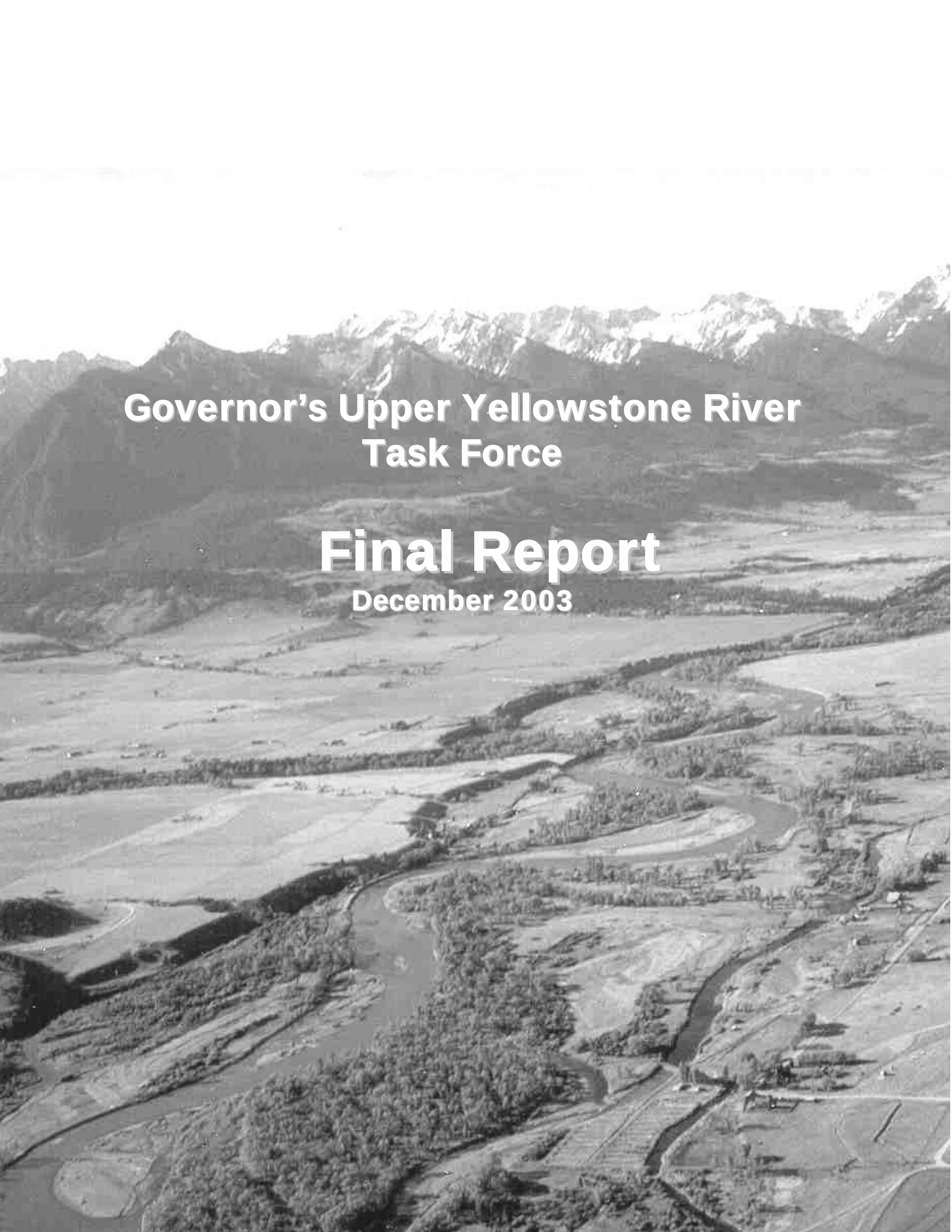

Governor's Upper Yellowstone River Task Force

Final Report

December 2003

Governor's Upper Yellowstone River Task Force

c/o Park Conservation District
5242 Highway 89 South
Livingston, Montana 59047

Telephone: 406.222.3701 or 406.222.2899 x-101
Fax: 406.222.8538
www.upperyellowstonerivertaskforce.org

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Cover Photo. Upper Yellowstone River in Paradise Valley. Photo courtesy of A. Hansen.

TABLE OF CONTENTS

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Report 2. *Upper Yellowstone River Mapping Project (National Wetland Inventory).*
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Report 10. *DRAFT Historic Channel Changes and Geomorphology of the Upper Yellowstone River, Gardiner to Springdale, Montana*.
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USGS, November 2003. Not for official release until June 2004.

Governor's Upper Yellowstone River Task Force
5242 Highway 89 South
Livingston, Montana 59047

Dear Governor Martz: December 4, 2003

The Governor's Upper Yellowstone Task Force with great pleasure is submitting its final report.

When we started this process we had no idea where it would lead us. Using science to lead us, we have been able to come to consensus on 43 recommendations. The consensus process we used in forming the recommendations provided for a lively discussion. Our minutes from these deliberations are almost verbatim. They should provide a good reference point in the future to the public thinking in 2003.

We all thank you for giving us this opportunity to address the issues on the Upper Yellowstone River. Our personal knowledge of the issues has been expanded greatly with the science we gathered and to understanding the different views and values held by all the users.

This project would not have been as comprehensive if the congressional delegation had not taken an active role. They provided money and support to allow us to broaden our scope and address more issues.

Thanks also must be given to the state agencies and federal agencies. They allowed us to understand the needs of government agencies and the agencies to understand the concerns of the public.

I also want to thank the public for their participation. The public brought many additional ideas to the table and contributed greatly to our discussions.

We appreciate your attending the Governor's Conference for the Upper Yellowstone River in October. This gave us a great opportunity to share with a broad audience our recommendations, science, and processes.

Best wishes,

John Bailey, Chair
Governor's Upper Yellowstone River Task Force

INTRODUCTION

2003 Final Report to the Governor

This report is the sixth and final in a series of yearly reports produced by the Governor's Upper Yellowstone River Task Force (hereafter referred to as the Task Force). The purpose of the report is to present the 43 final Task Force recommendations to Governor Judy Martz and to the interested public. In addition, the report provides a general overview of Task Force project activities and accomplishments during their term of service—from November 1997 to August 2003.

The main focus of this year's report is (1) to outline the 43 management recommendations adopted by the Task Force, and (2) to summarize Task Force investigations and the informational products created under their sponsorship over the past six years. Past accomplishments of the Task Force, their overall goals, and the policy processes used are also briefly described in this report. Detailed information on actions undertaken and products developed by the Task Force may also be found on their website at: www.upperyellowstonerivertaskforce.org or are available upon request.

In order to minimize repetition and the length of this report, we have used acronyms for commonly used phrases or agency titles. To assist readers unfamiliar with these terms, we have provided a list of acronyms and their definitions in *Appendix A.*

Task Force History & Purpose

In response to a request from the citizens of Park County, Montana's former Governor Marc Racicot created the Task Force in November 1997. County residents had experienced back-to-back, near 100-year floods in 1996 and 1997, and consequently recognized the need for a more comprehensive and consolidated planning effort for the upper Yellowstone River.

Following her predecessor's lead, Montana's current Governor Judy Martz reappointed the Task Force to a third and final, two-year term, which terminated in August 2003 (see *Appendix B. Governor's Executive Order No. 21-01*).

As directed by the Governor's executive order, the purpose of the Task Force was "to provide a forum for the discussion of issues that effect the Upper Yellowstone River Basin, particularly, to bring together landowners, sportsmen and sportswomen, and community leaders to develop a shared understanding of the issues and competing values and uses that impact the upper Yellowstone River." Further, the Task Force was directed to (1) bring together many diverse groups, who have an interest in the upper Yellowstone River, and (2) ensure that future projects affecting the river are planned and conducted in a manner that will preserve the integrity, beauty, values, and function of the upper Yellowstone River for Montanans now and in the future.

The Task Force has functioned as a structured non-regulatory organization that involved citizens, communities, and governmental agencies. The overall goal of the Task Force was to develop a set of publicly supported recommendations for river corridor management that address potential adverse cumulative effects of river channel modification, floodplain development, and natural events on the human community and riparian ecosystem.

Task Force Members

The Task Force was made up of a wide cross section of local area citizens, and local, state, and federal agency representatives. Individually, Task Force members represented specific constituencies within the local community; yet together, they formed a balanced table of diverse groups strongly concerned about the natural and economic resources in the Upper Yellowstone River Basin.

The Task Force was developed in the spirit of partnership and collaboration, and used a consensus-based approach to decision making (see *Appendix C. Task Force Ground Rules*, for details). They worked to raise awareness of environmental issues, and encouraged members of the community to get involved in all Task Force activities and to express their views openly.

The Task Force was set up with community participants functioning in a leadership role. Appointed by the governor, the 12 voting Task Force members represented the following interests: local businesses, property owners, ranchers, the angling community, conservation group(s), City of Livingston, Park Conservation District, and Park County. The eight non-voting Task Force members represented the following governmental agencies: Montana Department of Environmental Quality, Montana Department of Natural Resources and Conservation, Montana Department of Transportation, Montana Fish Wildlife and Parks, National Park Service (Yellowstone National Park), US Army Corps of Engineers, and US Forest Service. Agency partners provided technical knowledge and assistance, in addition to their regulatory and land management input.

From the beginning, the Task Force recognized the need to consolidate efforts in the upper Yellowstone River area, and to avoid duplication of effort. The make up of the Task Force was testament to the power of seating concerned citizens groups and governmental agencies as collaborative investigators and decision makers. Having many of the interested parties and agencies charged with regulation of river resources represented on the Task Force, streamlined much of the research and outreach efforts. In addition, and perhaps more importantly, the Task Force did not produce a study that will simply sit on a shelf. Quite the opposite was their intent. By giving regulatory agencies a voice in the process, the Task Force insured that their recommendations would have practical management and regulatory application.

A Community Partnership

Since 1997, the Task Force worked to accomplish their mission in a consensus-building manner, which stressed education, cooperation, broad-based community involvement, and voluntary participation. Through monthly meetings and educational activities they strived to reach out to the community, provided an opportunity for the public to participate in the process, and provided a forum for individuals and groups to express their views openly and in the spirit of teamwork.

Information gathered by the Task Force belongs to everyone. All data—survey results, maps, and publications—are being made available for the public's use and may be viewed or acquired by visiting the Task Force website at: upperyellowstonerivertaskforce.org or by contacting the Task Force/Park Conservation District office in Livingston, Montana.

TASK FORCE VOTING MEMBERS

John Bailey, Chair, Fly Fishing Business Owner
John has been chair of the Task Force since its inception. He is the owner of the internationally renowned Dan Bailey's Fly Shop in downtown Livingston. Born and raised in Paradise Valley, John has been fishing the upper Yellowstone River for more than 40 years. His home is located on a lagoon along the Yellowstone River.

Dave Haug, Vice Chair, Park Conservation District Supervisor
The Haug family has been farming and ranching in Park and Sweetgrass Counties for three generations, since the turn of the century. As a supervisor for the Park Conservation District, Dave's Board issues 310 permits on the Yellowstone River. He is also a board member of the Livingston Ditch Association, which uses water from the Yellowstone. Currently, his family farms and manages timber on their property in the Upper Yellowstone River Study Area.

Roy Aserlind, Emeritus Professor, University of Wisconsin-Madison
Roy grew up in Livingston and has owned a home on Ninth Street Island for 30 years, where he and his wife, Margot, now live the year around. Roy's concerns for the Yellowstone are all first hand, going back to the 1940s and 1950s when there was concerted effort to build the Allenspur Dam. There were also problems created by gold dredging near Chico Hot Springs resulting in a constantly muddied river, and a spruce budworm spraying episode that resulted in a massive poisoning of the river's aquatic insect life. Roy feels that he understands and appreciates the health and fragility of riverine structures.

Andrew Dana, local property owner along the Yellowstone River
Andrew Dana's family owns a working ranch on the Yellowstone River. He is an attorney who specializes in protection of agricultural, open-space, and natural lands and represents local, regional, and national land conservation organizations, as well as landowners. He consults nationally on land conservation issues and currently serves on the Advisory Council of the Yellowstone Park Foundation.

Doug Ensign, local property owner along the Yellowstone River
Doug and his wife, Zena, own and operate the Mission Ranch, a cattle ranch that has been in the family for two generations. The Yellowstone River flanks the ranch on its northern end for a stretch of two miles. The ranch contains extensive Yellowstone River bottomlands and several spring creeks.

Steve Golnar, City Manager, City of Livingston
Steve has dedicated his professional career to management of small towns in the Intermountain West. He grew up in Colorado, and received a Bachelors of Arts in Economics and Mathematics from Western State College in Gunnison and his Master of Governmental Administration from the University of Pennsylvania's Fels Government Center. Steve has worked with, and for, local governments on Colorado's western slope, served as Assistant Director of the Wyoming Association of Municipalities (1985-1988), and City Administrator of Kemmerer, Wyoming (1988-1995) before coming to Livingston.

Michelle Goodwine, CRS, ABR, GSI; past president of the Montana Association of REALTORS®. Michelle has worked as a REALTOR® for 16 years and owns Coldwell Banker Maverick Realty. Michelle is a Livingston native and she and her family live north of town on the Yellowstone River.

Jerry O'Hair, local property owner along the Yellowstone River
O'Hair family members are fourth generation Paradise Valley residents. Jerry owns and operates a working cattle ranch that adjoins the upper Yellowstone River for approximately three miles. The internationally famous Armstrong Spring Creek is also located on his ranch.

Brant Oswald, Conservation Group(s) Representative
Brant is a licensed Montana outfitter and co-manager of the Yellowstone Angler, a fly fishing shop in Livingston. He has served on the Board of Directors of both the Joe Brooks Chapter (Livingston) of Trout Unlimited and the Park County Environmental Council.

Ed Schilling, Park County Commissioner
Ed has lived in Montana for more than 40 years. He and his family reside in the Clyde Park area. In addition to his many commission duties, Ed is a local businessman and owner of AG Tech, a ranch and property consulting and management company.

Rod Siring, local property owner along the Yellowstone River
Rod was born and raised in Montana, and he and his wife have spent the last 35 years in Park County. Rod is a retired Park Electric Cooperative manager, where he worked for 30 years. He enjoys fishing and boating on the Yellowstone.

Bob Wiltshire, Angling Community Representative
For more than 20 years, Bob has been closely involved with the fishery of the Yellowstone River. Employed by the Federation of Fly Fishers, Bob has 15 years of outfitting experience, a background in fishery management, is a frequent lecturer about fisheries issues, and contributes angling articles to a number of publications.

FORMER TASK FORCE MEMBERS

Shaunda Hildebrand, 1997 & 1998, former Vice Chair, Park Conservation District Administrator

Mike Atwood, 1997-2001, former Vice Chair, Natural Resource Industry Representative
Mike Atwood has worked with natural resource and land management issues for more than 20 years with emphasis in forestry, large forestland acquisitions, and management. Mike and wife, Toni, own property and a vacation home along the Yellowstone River south of the Emigrant bridge.

Tom Lane, 1997-2001, former member, local property owner along the Yellowstone River
Long time residents of the Livingston area, the Lane family owns and operates cattle ranches throughout the state of Montana. Tom's family business includes a large operation and land holding along the upper Yellowstone River.

Ellen Woodbury, 1997-2003, former Park County Planner
Ellen was the Park County Planning Director and Floodplain Administrator from 1992 to 2003. She was nominated by the Park County Commissioners to represent the County on the Task Force. Ellen graduated from Montana State University and attended graduate school at Western Illinois University.

Jim Woodhull, 1997-2003, City of Livingston Planner
Born and raised in Livingston, Jim has been with the Livingston City Planning Office since graduating from Montana State University, Bozeman in 1992.

TASK FORCE EX-OFFICIO MEMBERS

Ken Britton, District Ranger
US Forest Service, Gallatin National Forest
Gardiner Ranger District
Gardiner, Montana

Liz Galli-Noble, Task Force Coordinator
Livingston, Montana

Tom Olliff, Chief, Branch of Natural Resources
National Park Service, Yellowstone National Park
Mammoth, Wyoming

Ron Archuleta, District Ranger
US Forest Service, Gallatin National Forest
Livingston Ranger District
Livingston, Montana

Robert Ray, Watershed Management Section Supervisor
Montana Department of Environmental Quality
Planning, Prevention, and Assistance Division
Helena, Montana

Laurence Siroky, Water Operations Bureau Chief
Montana Department of Natural Resources and Conservation
Floodplain Program, Water Resources Division
Helena, Montana

Allan Steinle, Montana State Program Manager
US Army Corps of Engineers,
Regulatory Branch
Helena, Montana

Stan Sternberg, Environmental Program Manager
Environmental Services
Montana Department of Transportation
Helena, Montana

Joel Tohtz, Fisheries Biologist
Montana Fish Wildlife and Parks
Livingston, Montana

FORMER EX-OFFICIO TASK FORCE MEMBERS

Doug McDonald (Corps), Ken Kastelitz (City of Livingston), Joel Marshik (MDT), Stuart Coleman (YNP), John Logan (USFS), Stuart Lehmann (DEQ), Terri Marceron (USFS), Michael Rabbe (Corps), Wayne Brewster (YNP), Dean Yashan (DEQ), and Tom Osen (USFS).

TECHNICAL ADVISORY COMMITTEE (TAC)

The Task Force appointed a Technical Advisory Committee (hereafter referred to as the TAC) in 1998. The TAC's role was (1) to assist the Task Force by offering scientific guidance, (2) to develop an integrated research program, and (3) to evaluate research proposals and results. The TAC also took the lead in data synthesis and interpretation of information for the Task Force.

Photo 1. TAC meeting. Photo by E. Galli-Noble.

The TAC was designed to provide guidance and advice to the Task Force, when requested, based on the results of the scientific investigations. The TAC was given both broad direction and specific missions by the Task Force, and had the flexibility to determine how best to accomplish its job. The TAC had no authority to make policy decisions or recommendations on behalf of the Task Force; rather, its role was to work as directed by the Task Force to ensure that (1) the right questions were asked, (2) the best approach and methods were used to answer questions, (3) the data collected were objective, defensible, and trustworthy, and (4) the answers provided were understandable and relevant.

As the upper Yellowstone River investigation expanded over the past six years, so too did the TAC. Five individuals were officially appointed by the Task Force to form the nucleus of the committee. Reflecting the expansion of the overall project, the TAC grew to include agency liaisons, Task Force staff, and research team principal investigators (see *Table 1* for list of TAC members). Thus, the TAC fostered communication and data sharing amongst the independent research efforts, and ensured that data synthesis was possible in the final phase of the project. Coordination and consistency between study components—particularly with respect to stratification and selection of sampling and detailed mapping sites—was achieved through TAC oversight.

Photo 2. TAC members at the Governor's Conference. Photo by E. Galli-Noble.

In addition to study management, members of the TAC have played other vital roles on the project. TAC members have provided the Task Force with a readily available scientific sounding board during meeting discussion and recommendation deliberations. They have also helped conduct several educational events for interested parties in

Photo 3. TAC and Task Force members at the Governor's Conference. Photo by E. Galli-Noble.

the watershed, as well as attending and presenting at many conferences and workshops focusing on the Yellowstone River.

Finally, the TAC chair and all of the research team leaders formally presented their research findings to the Task Force from September 2002 through April 2003. Subsequently, they presented research results, and lectures on integration of the science and cumulative impact analysis at the *Governor's Conference for the Upper Yellowstone River* on October 21, 2003.

The success of the Upper Yellowstone River Project is due in large part to the dedication, professionalism, and scientific integrity of its TAC. The Task Force cannot thank them enough for the vital role that they played during this six-year process. In particular, we owe a great debt to Dr. Duncan Patten, TAC chair, who volunteered years of his personal time to manage the scientific investigations and educate the community about riverine ecology and the upper Yellowstone River system.

Photo 4. TAC chair and President Gamble. Photo by E. Galli-Noble.

Table 1. Technical Advisory Committee Members and Researcher Team Leaders

Name	Profession / Title	Agency / Affiliation
*Dr. Duncan Patten, Chair	Riparian Ecologist	Montana State University
Dr. Zack Bowen	Fish Habitat Research Team Leader	USGS-BRD
Monica Brelsford / Dr. Bruce Maxwell	Historic Watershed Land Use Assessment	Montana State University
Tim Bryggman	Economist/Socio-Economic study advisor	Montana DNRC
*Chuck Dalby	Geomorphology Research Team Leader	Montana DNRC
*Liz Galli-Noble	Coordinator, Liaison	Task Force
Mike Gilbert	Environmental Resources Specialist	US Army Corps of Engineers
*Tom Hallin	Professional Surveyor	Private Survey Business
Dr. Andy Hansen	Wildlife Research Team Leader	Montana State University
Rob Hazlewood / George Jordan	Wildlife/Fisheries Biologists	USFWS
Steve Holnbeck	Hydraulic Analysis Research Team Leader	USGS-WRD
Dr. Mike Merigliano	Riparian Trend Analysis Team Leader	University of Montana
Pat Newby	Yellowstone Basin Water Quality Monitoring Specialist	Montana DEQ
Chuck Parrett	Hydraulic Analysis Research Team Leader	USGS-WRD
Tom Pick	Physical Features Inventory Current Watershed Land Use Team Leader	USDA NRCS
*Jim Robinson	Geomorphology Research Team Leader	Montana DNRC
*Dr. Greg Schildwachter (Former TAC member)	Wildlife Biologist	Intermountain Forest Association
*Brad Shepard	Fisheries Biologist	American Fisheries Society
Allan Steinle	Environmental Resources Specialist	US Army Corps of Engineers
Dr. Al Zale	Fish Populations Research Team Leader	Montana State University

* = Task Force-appointed TAC members.

GOVERNOR'S UPPER YELLOWSTONE RIVER TASK FORCE RECOMMENDATIONS—A BRIEF SUMMARY

The Task Force developed and applied a formal process, *Steps for Formal Action on Task Force Recommendations* (see *Appendix C)*, to provide structure and equity as they deliberated and ultimately reached consensus on a package of 43 final recommendations. The Task Force proposed and deliberated on recommendations from May 6, 2003 to August 25, 2003, meeting 12 times during that period. Minutes of those meetings documented—almost verbatim—the discussions and recommendation deliberations conducted by Task Force members and interested members of the public, and are available by visiting the Task Force website at: www.upperyellowstonerivertaskforce.org or upon request at the Task Force/Park Conservation District office.

All 43 recommendations are presented below. These recommendations are in no order of priority; instead, they have been placed under pertinent discussion topic categories and those categories are simply presented in alphabetical order. Following this summary, each recommendation is addressed in detail.

The Governor's Upper Yellowstone River Task Force recommends that:

I. BANK STABILIZATION

I.a. "A local Bank Stabilization Information Clearinghouse should be created to provide information about new and existing methods of bank stabilization, including methods that complement the natural system and methods that might be appropriate for specific individual situations."

I.b. "Studies should be developed which would indicate what types of bank stabilization would work best to achieve particular goals within different geomorphic reaches of the upper Yellowstone River."

II. BRIDGES

II.a. "When the following bridges are replaced or removed, hydraulic impacts identified in the Geomorphology Study should be lessened: Emigrant Bridge; Carter's Bridge; Interstate-90 Bridge; Railroad Bridge at Highway 10/89 South[1]; Highway 10/89 South Bridge[1]; Highway 89 North Bridge[1] (near the Shields River); Railroad Bridge at Highway 89 North[1] (near the Shields River); and Springdale Bridge."

II.b. "Solutions should be developed to remove abandoned bridge abutments and piers, and to reclaim abandoned bridge approaches."

II.c. "All new bridges and bridge substructure reconstructions (for example, piers and abutments) should be designed to minimize upstream and downstream negative impacts of sedimentation and gravel deposition."

II.d. "Bridge design considerations on the upper Yellowstone River should include examination of the cumulative impacts and the costs and benefits of zero backwater standards at any scheduled reconstruction. As an initial project, a zero backwater design at the Highway 10/89 South Bridge[1] over the Yellowstone (east of Livingston) should be evaluated to increase the flow capacity of the river through town, and the Governor should enlist the cooperation and support of the railroad to build a parallel zero backwater bridge north of the Highway 10/89 South Bridge[1]."

[1] Present day US Highway 89 (east of Livingston) was formally called Highway 10, and sections of that road still retain the Highway 10 designation. There are two sets of side-by-side bridges (public and railroad) crossing the upper Yellowstone River on Highway 89 within a short distance of each other; to avoid further confusion the following descriptive bridge information has been provided:
The Highway 10/89 South Bridge and its parallel railroad bridge are located near KPRK Radio Station at T2S R10E Section 7.
The Highway 89 North Bridge and its parallel railroad bridge are located near the Shields River at T1S R10E Section 26.

III. FINANCIAL INCENTIVES

III.a. "Financial incentives should be established to help landowners on the upper Yellowstone River, on a voluntary basis, (1) to remove flood control and bank stabilization structures that no longer function properly or are obsolete; and (2) to modify or replace flood control and bank stabilization structures, provided that such modified or replaced structures eliminate or mitigate undesirable impacts on the riparian system."

III.b. "A Park County Bond Issue should be proposed to protect and preserve agricultural lands, scenic views, socially desirable riverscapes, and important riparian habitats along the Yellowstone River; and a representative Citizens' Advisory Council should be established to develop criteria, to recommend expenditures, and to facilitate approval of projects funded by public monies."

III.c. "A fund should be established with the State of Montana to receive legislative allocations, agency grants, and private donations for the purpose of matching, on a dollar-for-dollar basis, all projects that have been funded by the Citizens' Advisory Council pursuant to a Park County Bond Issue to protect and preserve agricultural lands, scenic views, socially desirable riverscapes, and important riparian habitats along the Yellowstone River."

III.d. "State, federal, and private sources should be developed to increase the funding available for conservation easements on lands in close proximity to the upper Yellowstone River."

III.e. "A study should be conducted to determine the feasibility of creating a voluntary, market-based program to remove, relocate, or redesign bank stabilization structures by allowing transfers of, and trade in, state and federal bank stabilization permits between willing parties."

III.f. "A grant writer should be engaged by the Montana Department of Fish, Wildlife and Parks, the Governor's Office on Economic Development, City of Livingston, and Park County to pursue funding for projects of joint interest related to the upper Yellowstone River."

IV. FISH / FISHERIES

IV.a. "Annual fish population surveys should be conducted on all sections where they have historically been made. If indications of a declining population trend are detected, additional studies must be implemented to identify potential causes and recommend actions that will restore populations."

IV.b. "Further investigations into the production and rearing of juvenile fish in the upper Yellowstone River should be conducted, particularly to determine the relative importance of lateral side channels, mainstem habitats, overflow habitats, and spring creeks."

IV.c. "New irrigation projects should consider fish-friendly construction and management in their design."

V. FLOODPLAIN DEVELOPMENT

V.a. "No additional Livingston public schools should be constructed on Livingston Island (also known as McLeod Island)."

VI. FUTURE SCIENCE / MONITORING / RESEARCH

VI.a. “The US Geological Survey-Helena and the US Geological Survey-Biological Resources Division should be encouraged to monitor and measure the effects of instream structures on the river over time.”

VI.b. “The Natural Resource Information System (NRIS) should house all Task Force Geographic Information System (GIS) information.”

VI.c. “A study should be conducted to understand the river dynamics and hydrology related to sloughing of river banks at Deep Creek, the Weeping Wall, and Mallard’s Rest.”

VI.d. “A study should be funded to identify the current conflicts and potential future conflicts arising from changing uses of the upper Yellowstone River.”

VI.e. “The development and maintenance of a long-term database of macroinvertebrate populations should be encouraged to monitor water quality in the Yellowstone River.”

VI.f. “The drilling site known as Hobbs Well should be thoroughly investigated to determine what, if any, impacts it has created, or may create, on subterranean and surface water flows.”

VI.g. “People should be encouraged to study different techniques or ways to alleviate the flooding damage through the upper Yellowstone River study area.”

VI.h. “Regulatory program modifications for activities that affect the upper Yellowstone River should be considered in the context of the Governor’s Upper Yellowstone River Task Force scientific investigations.”

VI.i. “A river migration study should be undertaken to measure the potential for river channel avulsion between the Livingston Ditch headgate and Interstate 90, and to identify measures which could be implemented to prevent flood damage to the Livingston urban area.”

VI.j. “The State of Montana, along with federal sources, should fund an Upper Yellowstone Research and Monitoring program to coordinate efforts by agency personnel, universities and researchers, and the community to develop and implement a long-term research and monitoring program in the upper Yellowstone River study area.”

VII. NEW STAKEHOLDER GROUP

VII.a. “Stakeholder group(s) should be developed, with full public participation, to continue to monitor the status of the upper Yellowstone River, to make recommendations about river related issues, to encourage long-term monitoring of river related projects, to promote the completion of identified research needs, and to examine the implementation of the Governor’s Upper Yellowstone River Task Force recommendations.”

VIII. NINTH STREET ISLAND

VIII.a. “Implement a solution that minimizes cumulative impacts to achieve hydraulically-balanced water surface elevations, with little or no backwater, in the channels separated by Ninth Street and Siebeck Islands.”

VIII.b. “Park County should be encouraged to develop a free-span bridge to Ninth Street Island and to pursue such a bridge through the Department of Transportation’s Adopt-A-Bridge-Program or any other funding source.”

IX. NOXIOUS / INVASIVE PLANTS

IX.a. “Additional studies should be designed and conducted to document the proliferation of noxious or invasive plants along the river corridor, and to evaluate the impacts on fish, wildlife, water quality, soil and bank stability, and economic productivity; and programs that monitor and reduce invasive plant infestations should be supported.”

X. PERMITTING / REGULATORY / MANAGEMENT DECISIONS

X.a. “The streamlined uniform permit application process among local, state, and federal permitting agencies should be continued and, when possible, improved.”

X.b. “All permitting and/or management decisions (including the Special Area Management Plan) on the upper Yellowstone River should thoroughly consider and must recognize and respect:

1. the function of the flood plain, including but not limited to: connectivity between the river channel and the flood plain; regeneration of cottonwoods and other riparian vegetation; and maintenance of side channel habitat for spawning and juvenile fish; and
2. the public and private interest in protecting private property and important social, economic, and natural resources existing on or near the flood plain; and
3. the geomorphology of particular river reaches and their different inherent characteristics.”

X.c. “ Policies should be continued that allow for the removal of large woody debris on a localized basis to protect public and private infrastructure, to assure public safety, and to allow side channel function when necessary.”

X.d. “Necessary dredging of sedimentation should be continued to maintain irrigation structures and canals.”

X.e. “The Montana Department of Fish, Wildlife, and Parks should develop an angling ‘closure’ matrix specifically designed to address any future severe conditions on the upper Yellowstone River to protect its unique characteristics including its fisheries and fish habitat.”

X.f. “The US Army Corps of Engineers should include in their 205 Study: (1) an investigation of widening the channel by resloping the north bank, in a stepped or terraced fashion, around cross sections #55,000 and #56,000 on the preliminary floodplain map, while maintaining a park-like environment; and (2) should identify, if possible, funding for mitigation of landfills if necessary.”

X.g. “Park County should be asked to join with the City of Livingston to co-sponsor the Section 205 Study in order to develop a comprehensive approach to structural and non-structural solutions to floodplain management issues in and around the City of Livingston.”

X.h. “An analysis should be conducted to determine the feasibility of relocation and buyout options for property owners who are located or reside in the floodway in the Livingston area.”

X.i. “Mining and mining-related dredging should be prohibited in the active bankfull bed and banks of the upper Yellowstone River. Mining and mining-related dredging and sale of sand and gravel as a byproduct of bank stabilization, flood control, and maintenance of irrigation structures and canals are not prohibited under this recommendation.

X.j. “The US Army Corps of Engineers should conduct a public scoping process during the development of the Special Area Management Plan for the upper Yellowstone River.”

XI. PUBLIC STRUCTURES

XI.a. “Existing public structures that have undesirable impacts on the upper Yellowstone River’s riparian system function should be modified or replaced, provided that such modified or replaced structures eliminate or mitigate those undesirable impacts with no significant adverse effects on existing public or private entities.”

XI.b. “Any structural or non-structural modifications to the river bank through Livingston should blend with the environmental, cultural, and historic themes of the community to the extent possible.”

XI.c. “Construction of a flood control dam and impoundment on the mainstem of the Yellowstone River not be considered as a potential management alternative.”

Photo 5. Upper Yellowstone River in Paradise Valley. Photo by E. Galli-Noble.

GOVERNOR'S UPPER YELLOWSTONE RIVER TASK FORCE RECOMMENDATIONS—ADDRESSED IN DETAIL

Recommendations are in no order of priority.

The Governor's Upper Yellowstone River Task Force recommends that:

I. BANK STABILIZATION

I.a. "A local Bank Stabilization Information Clearinghouse should be created to provide information about new and existing methods of bank stabilization, including methods that complement the natural system and methods that might be appropriate for specific individual situations."

Landowners indicated to the Task Force that they would benefit from a locally housed information center focusing specifically on bank stabilization methods. There is a great deal of information already published on the subject that needs to be compiled and consolidated for ease of access. New information from local landowners' experiences could also be documented and shared with others through this entity. Task Force members agreed that a one-size-fits-all approach cannot be taken when it comes to bank stabilization. There is still much to learn when it comes to what works best for the individual landowner, while also complementing the natural river system.

The Task Force recommended that the clearinghouse be housed locally, within Park County, in order to provide the most benefit to local landowners. The Park Conservation District and Park County were identified as possible entities to house the clearinghouse, but no specific location was agreed upon during Task Force deliberations.

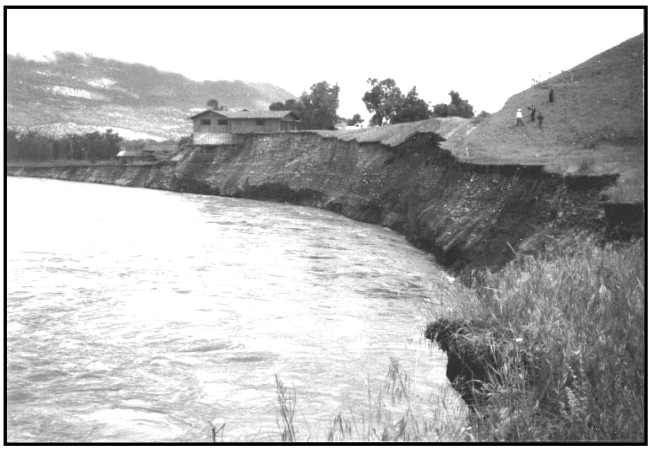

Photo 6. House lost in high water in 1997. Photo source unknown.

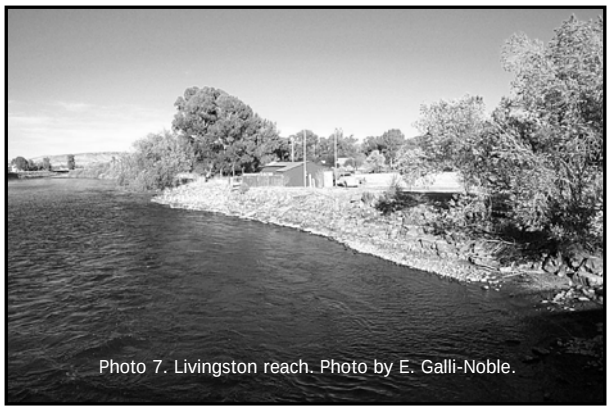

Photo 7. Livingston reach. Photo by E. Galli-Noble.

Photo 8. Barb. Photo courtesy of MSU.

Recommendation I.a. deliberations: This recommendation was originally proposed on May 6, 2003; discussion continued and consensus was reached on May 22, 2003.

I.b. "Studies should be developed which would indicate what types of bank stabilization would work best to achieve particular goals within different geomorphic reaches of the upper Yellowstone River."

In the same vein as the previous Recommendation I.a. discussion, this recommendation was carefully worded to stress flexibility for landowners as they attempt to apply unique, appropriate, and sensitive methods of bank stabilization in differing geomorphic reaches of the upper Yellowstone River.

This recommendation identifies the need to address the differing geomorphic reach types when making decisions about what types of bank stabilization will work best to achieve particular land-management goals. That wording is a direct reflection of the results presented in the geomorphology study (Report 10, page 16; see *Table 2* on next page), which outlines the differing geomorphic channel types found in the upper Yellowstone River corridor and then presents the characteristics associated with those types: natural confinement, slope, pattern, sediment texture, sediment sources and availability, meander belt width, and channel stability. Given this scientific information provided, the Task Force acknowledged that geomorphic factors must be taken into account in order for bank stabilization projects to be appropriately applied and properly constructed.

Photo 10. Barb downstream from Mallards Rest. Photo by E. Galli-Noble.

Photo 9. Upper Yellowstone River near Springdale. Photo courtesy of NRCS.

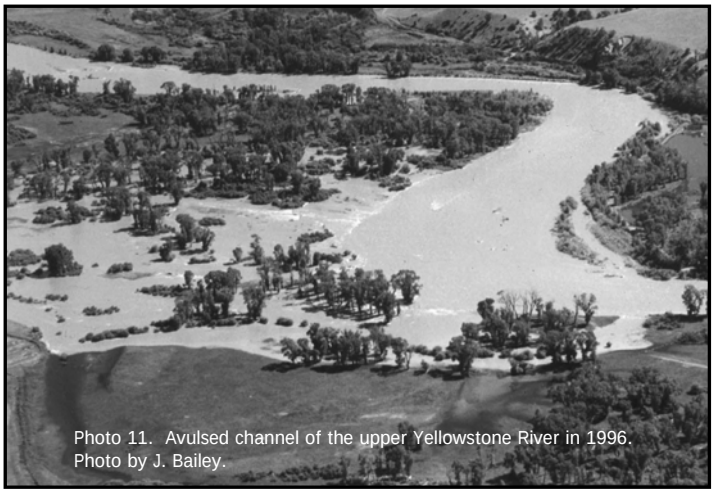

Photo 11. Avulsed channel of the upper Yellowstone River in 1996. Photo by J. Bailey.

Recommendation I.b. deliberations: This recommendation was originally proposed on May 6, 2003 and discussion continued and consensus was reached on May 22, 2003.

Table 2. Geomorphic Classification Scheme Applied to Upper Yellowstone River Channels; Bisson and Montgomery (1996) and Montgomery and Buffington (1997) Classification Used (Source: Report 10, page 16).

Channel Type	Natural Confinement	Channel Slope	Pattern	Meander Belt Width	Sediment Texture	Sediment Sources	Sediment Availability	Frequency of Occurrence				Channel Stability
								Grave Bars	Large Woody Debris	Side Channel	Channel Modification	
Bedrock	High	>0.003	S<1.5	Low	Precambrian, Paleozoic,or Cretaceous Bedrock	Low	Low (supply limited)	Low	Low	Low	Low	Lateral = high Vertical= high
Cascade	High	>0.003	S<1.5	Low	Gravel, Cobble, Boulder	Low	Low (supply limited)	Low	Low	Low	Low	Lateral = high Vertical= high
Plane Bed	Medium, High	0.001 to 0.003	S=1.1 to 2	Low	Gravel, Cobble, Boulder	Low	Low (supply limited)	Low	Low	Low	Low	Lateral = high Vertical= high
Pool-Riffle	Low, Medium, High	0.001 to 0.003	S=1.5 to 2.5	Medium High	Sand, Cobble, Gravel	Moderate	Moderate (supply or transport limited)	Low / Med	Low Medium High	Low Medium	Low Medium High	Lateral = varies Vertical= varies
Anabranching	Low	<0.002	Multiple Channel	Medium High	Cobble, Sand, Gravel	High	Transport limited	High	High	High	High	Lateral = varies Vertical= varies
Anabranching /Braided	Low	<0.002	Multiple Channel / Braided	Medium High	Sand, Gravel	High	Transport limited	High	High	High	High	Lateral = low Vertical= low
Forced	Varies											

II. BRIDGES

II.a. "When the following bridges are replaced or removed, hydraulic impacts identified in the Geomorphology Study should be lessened: Emigrant Bridge; Carter's Bridge; Interstate-90 Bridge; Railroad Bridge at Highway 10/89 South[1]; Highway 10/89 South Bridge[1]; Highway 89 North Bridge[1] (near the Shields River); Railroad Bridge at Highway 89 North[1] (near the Shields River); and Springdale Bridge."

[1] Present day US Highway 89 (east of Livingston) was formally called Highway 10, and sections of that road still retain the Highway 10 designation. There are two sets of side-by-side bridges (public and railroad) crossing the upper Yellowstone River on Highway 89 within a short distance of each other; to avoid further confusion the following descriptive bridge information has been provided: The Highway 10/89 South Bridge and its parallel railroad bridge are located near KPRK Radio Station at T2S R10E Section 7. The Highway 89 North Bridge and its parallel railroad bridge are located near the Shields River at T1S R10E Section 26.

When the Montana Department of Transportation was asked to join the Task Force in 1997, Governor Racicot clearly indicated that a recommendation that all the bridges on the upper Yellowstone River be replaced was not a financially viable option. Nevertheless, the Task Force sought scientific information about the effects of existing bridges on the upper Yellowstone River and asked the geomorphology study team to investigate the hydraulic impacts of all of the upper Yellowstone River bridges. This recommendation ties directly to the geomorphology study findings (see Report 10, pages 39 and 40). Of the bridges that cross the Yellowstone River within the Upper Yellowstone River Study Area (Gardiner to Springdale, Montana), a significant percentage were found to have a moderate to high effect on channel processes and attributes (see *Table 3* on next page). The Task Force recommended that only when these problematic bridges are scheduled to be replaced or removed should their hydraulic impacts be lessened.

According to geomorphology study findings, bridges may affect the river channel in several ways: (1) the bridge opening typically constricts flow and this causes a local increase in velocity and erosive power, resulting in contraction scour; and (2) if constriction is significant, a backwater may form, which reduces the sediment transport capacity of the upstream channel and aggradation of the channel occurs. Due to the steep slope of the upper Yellowstone River, the primary zone of influence of bridges is likely limited to a relatively short distance up and downstream. Bridge effects were qualitatively assessed based on comparative examination of 1948 and 1999 photo mosaics and examination of channel changes at the site.

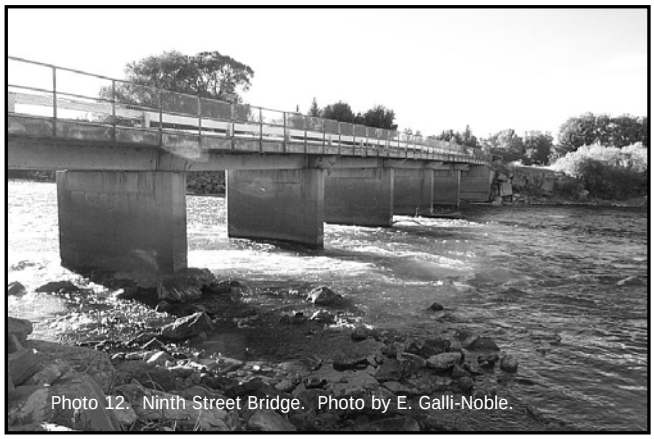

Photo 12. Ninth Street Bridge. Photo by E. Galli-Noble.

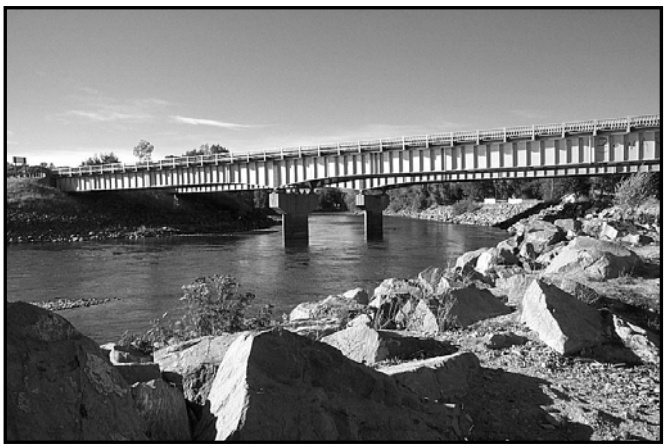

Photo 13. Interstate 90 Bridge. Photo by E. Galli-Noble.

Table 3. DRAFT Geomorphic Effects of Upper Yellowstone River Bridges (Source: Report 10, page 40)

ID #	Bridge	Year Constructed	Relative Physical Effects	Upstream	Downstream
1	Gardiner Bridge	1930	None	--	--
2	Corwin Springs Bridge	1908	Low	Slight Aggradation	--
3	Carbella Bridge	1918	None	--	--
4	Point of Rocks Bridge	1958	Low	--	Slight Aggradation
5	Emigrant Bridge	1949	Moderate	Aggradation	--
6	Mill Creek Bridge	1960	None	--	--
7	Pine Creek Bridge	1990	Low	Aggradation	--
8	Carters Bridge	1921	Moderate	Aggradation	Aggradation
9	Interstate 90 Bridge (south)*	1962	High	Aggradation/Incision	Incision
10	Interstate 90 Bridge (north)*	1962	High	Aggradation/Incision	Incision
11	9th Street Bridge	1964	Low	Incision	Slight Aggradation
12	Highway 10/89 S Bridge*	1934	High	Aggradation	Aggradation
13	Parallel Railroad Bridge*	1919	High	Aggradation	Aggradation
14	Shields (Highway 89 N) Bridge*	1955	High	Aggradation/Incision	Aggradation/Incision
15	Parallel Railroad Bridge *	1897	High	Aggradation/Incision	Aggradation/Incision
16	Springdale Bridge	1980	Moderate	Aggradation	--

* = The geomorphic effects of these sets of parallel bridges were not considered separately.

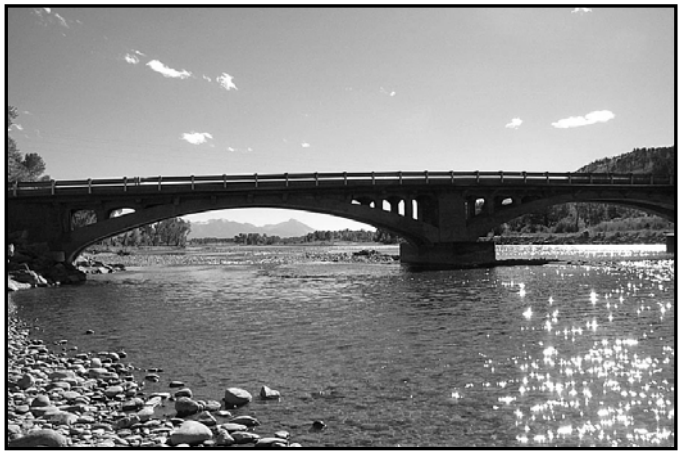

Photo 14. Carters Bridge. Photo by E. Galli-Noble.

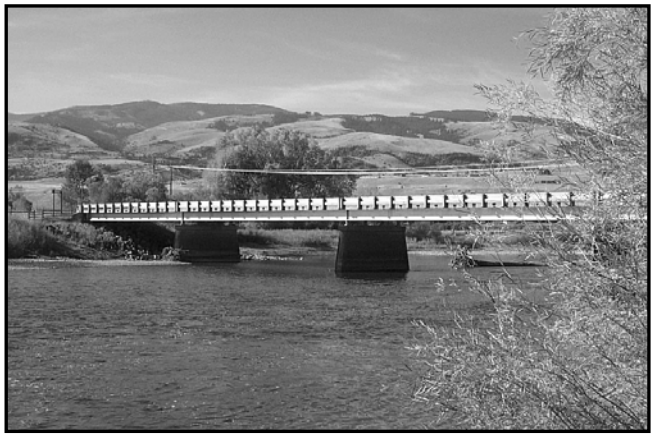

Photo 15. Emigrant Bridge. Photo by E. Galli-Noble.

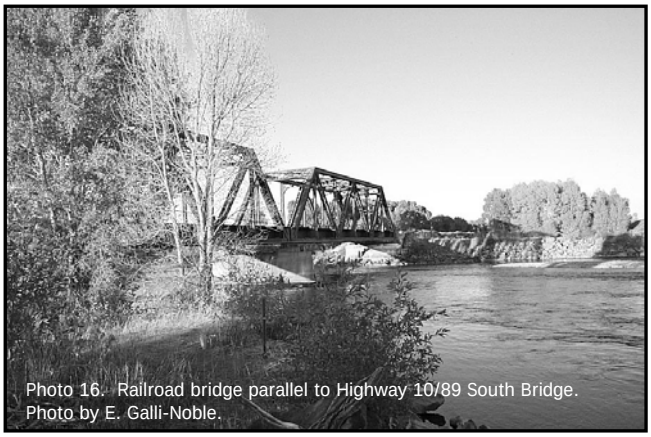

Photo 16. Railroad bridge parallel to Highway 10/89 South Bridge. Photo by E. Galli-Noble.

Recommendation IIa. deliberations: This recommendation was originally proposed and reached consensus on June 2, 2003.

II.b. "Solutions should be developed to remove abandoned bridge abutments and piers, and to reclaim abandoned bridge approaches."

The upper Yellowstone River is a high recreational use river, and Task Force members expressed concern about both the hydraulic effects and safety hazards that abandoned structures create when left within the channel. They also emphasized that it is not just the banks and channel of the river that are of concern to local citizens, but that it is also important that abandoned bridge approaches be reclaimed for safety, access, weed prevention, and aesthetic reasons.

Additional information provided to the Task Force in November 2003: State agencies have contacted the Task Force office asking if there are specific areas where they may focus their efforts in addressing this issue.

The Task Force identified the following locations as problematic:

1. Pilings in the river from the old Springdale Bridge.
2. Piling in the river near Gray Bear Fishing Access.
3. Piling in the river in the area of: Township 6 South, Range 8 East, Section 8.
4. Abandoned Harvest Bridge approach near Mayors Landing.
5. Abandoned railroad bridge off of Highway 89 North, heading north up the Shields Valley.

It should be noted that these are not the only areas that may need agency attention.

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Recommendation II.b. deliberations: This recommendation was originally proposed and reached consensus on June 2, 2003.

II.c. "All new bridges and bridge substructure reconstructions (for example, piers and abutments) should be designed to minimize upstream and downstream negative impacts of sedimentation and gravel deposition."

Building on the concepts introduced in Recommendation II.a.—that when bridge openings constrict flow, a local increase in velocity and erosive power often occurs, resulting in contraction scour; and if the constriction is significant, a backwater may form, reducing the sediment transport capacity of the upstream channel and aggradation of the channel occurs—this recommendation suggests that we need to rethink the way we design bridges in the future.

Again, realizing that all the bridges on the Yellowstone cannot simply be rebuilt or replaced in the short term, the Task Force recommends that when new bridges are built or major maintenance to existing bridge substructure is scheduled, the design of those projects should actively seek to minimize upstream and downstream negative impacts of sedimentation and gravel deposition.

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Recommendation II.c. deliberations: This recommendation was originally proposed and reached consensus on July 22, 2003.

II.d. "Bridge design considerations on the upper Yellowstone River should include examination of the cumulative impacts and the costs and benefits of zero backwater standards at any scheduled reconstruction. As an initial project, a zero backwater design at the Highway 10/89 South Bridge[1] over the Yellowstone (east of Livingston) should be evaluated to increase the flow capacity of the river through town, and the Governor should enlist the cooperation and support of the railroad to build a parallel zero backwater bridge north of the Highway 10/89 South Bridge[1]."

[1] Present day US Highway 89 (east of Livingston) was formally called Highway 10, and sections of that road still retain the Highway 10 designation. There are two sets of side-by-side bridges (public and railroad) crossing the upper Yellowstone River on Highway 89 within a short distance of each other; to avoid further confusion the following descriptive bridge information has been provided: The Highway 10/89 South Bridge and its parallel railroad bridge are located near KPRK Radio Station at T2S R10E Section 7. The Highway 89 North Bridge and its parallel railroad bridge are located near the Shields River at T1S R10E Section 26.

As was stated in the previous recommendations concerning bridges on the Yellowstone, the Task Force again stressed the need for new bridge design considerations and brought in the concept of zero backwater standards for future projects. In this recommendation, the Task Force does not dictate that this standard be required on all future projects; rather, they recommended that an examination of the cumulative impacts and the costs and benefits of zero backwater standards be included in Yellowstone River bridge designs in the future. They even suggested a test case: the replacement of the Highway 10/89 South Bridge, scheduled for 2008. The idea behind the zero back water application on the Highway 10/89 South Bridge is that by eliminating backed up water at the bridge, flow levels through the urban reach would be reduced, which would likely benefit many Livingston residents and lessen impacts to private and publicly held properties.

Further, the Task Force acknowledges that if the highway bridge is replaced with a better design, and if the railroad bridge downstream is not rebuilt to the same standards, the constraint remains the railroad bridge and negative impacts and backwater will not be reduced. The Task Force recommends, therefore, that the Governor enlist the cooperation and support of the railroad to build a zero backwater bridge as well. The hope is that the railroad becomes a partner in this effort.

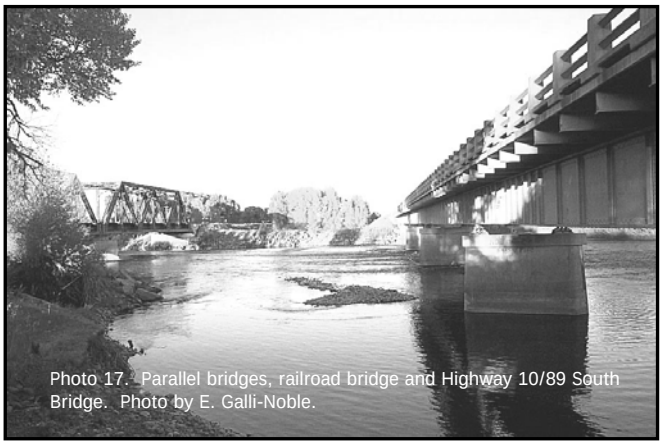

Photo 17. Parallel bridges, railroad bridge and Highway 10/89 South Bridge. Photo by E. Galli-Noble.

Additional Information provided to the Task Force in October 2003:
Subsequently, David Cook, bridge specialist for Montana Rail Link, attended the *Governor's Conference for the Upper Yellowstone River* in October 2003 and expressed interest in helping to resolve this bridge issue. Mr. Cook asked if he could be added to the team working on this issue; he may be contacted at: Montana Rail Link, 101 International Way, Missoula, MT 59808.

Recommendation II.d. deliberations: This recommendation was originally proposed and reached consensus on August 5, 2003.

III. FINANCIAL INCENTIVES

III.a. "Financial incentives should be established to help landowners on the upper Yellowstone River, on a voluntary basis, (1) to remove flood control and bank stabilization structures that no longer function properly or are obsolete; and (2) to modify or replace flood control and bank stabilization structures, provided that such modified or replaced structures eliminate or mitigate undesirable impacts on the riparian system."

Members of the Task Force, in particular landowners along the river, acknowledged that there are old flood control or bank stabilization structures (for example, jetties and levees) that no longer function properly or are obsolete, and could be modified or removed. However, the costs associated with structure modification or removal would be prohibitive for many landowners, and thus likely never be done without some kind of incentive program. Financial incentives were deemed one way of starting the process of addressing these obsolete structures.

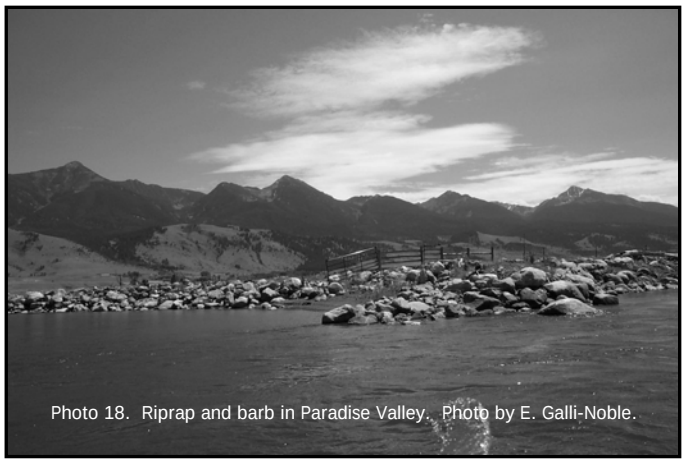

Photo 18. Riprap and barb in Paradise Valley. Photo by E. Galli-Noble.

Photo 19. Riprapped bank. Photo courtesy of MSU.

Photo 20. Jetty. Photo by courtesy of MSU.

Recommendation III.a. deliberations: Two recommendations were combined in this final recommendation; the first one was originally proposed and reached consensus on May 22, 2003 and the second was proposed and reached consensus on June 2, 2003.

III.b. "A Park County Bond Issue should be proposed to protect and preserve agricultural lands, scenic views, socially desirable riverscapes, and important riparian habitats along the Yellowstone River; and a representative Citizens' Advisory Council should be established to develop criteria, to recommend expenditures, and to facilitate approval of projects funded by public monies."

This recommendation is directly tied to results presented in the socio-economic study (Report 3). It focuses on values that are important to the local community, which were conveyed to that research team during their survey work in Park County. However, rather than dictate how the local community should manage for those values, the Task Force recommended that a Park County Bond Issue should be established, which would allow the public to vote on values they wish to protect along the Yellowstone River. Further, the Task Force recommended establishing a Citizen's Advisory Council in order to continue local leadership on river issues and to keep the decision making local. Many members of the public suggested that the new advisory council be patterned after the Task Force in structure and broad constituency make up. Finally, the Task Force recommended that the Park County bond focus on providing funds for land protections along the Yellowstone River, not throughout the entire County.

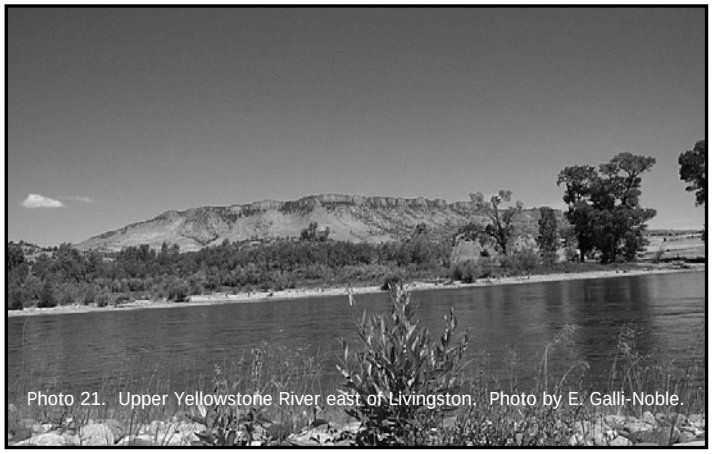

Photo 21. Upper Yellowstone River east of Livingston. Photo by E. Galli-Noble.

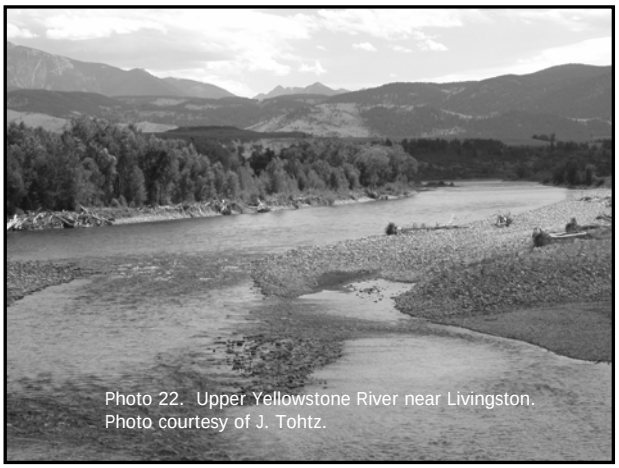

Photo 22. Upper Yellowstone River near Livingston. Photo courtesy of J. Tohtz.

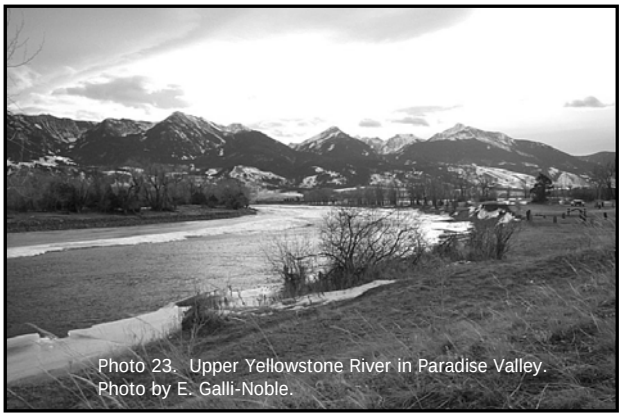

Photo 23. Upper Yellowstone River in Paradise Valley. Photo by E. Galli-Noble.

Recommendation III.b. deliberations: This recommendation was originally proposed on July 8, 2003, and was discussed further and reached consensus on July 15, 2003.

III.c. "A fund should be established with the State of Montana to receive legislative allocations, agency grants, and private donations for the purpose of matching, on a dollar-for-dollar basis, all projects that have been funded by the Citizens' Advisory Council pursuant to a Park County Bond Issue to protect and preserve agricultural lands, scenic views, socially desirable riverscapes, and important riparian habitats along the Yellowstone River."

The intent of this recommendation is to provide a mechanism to fund the efforts of the Citizen's Advisory Council—introduced in the proceeding Recommendation III.b. It specifically targets State allocations, agency grants, and private donations as a way of leveraging local dollars that are committed toward protecting and preserving agricultural lands, viewsheds, and the health and function of the upper Yellowstone River.

The Task Force recognized that more than just local citizens are concerned about the Yellowstone River, and therefore, they targeted a wide array of funding sources to carry out river-focused activities in Park County.

Photo 24. Upper Yellowstone River in Paradise Valley. Photo by E. Galli-Noble.

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Recommendation III.c. deliberations: This recommendation was proposed and reached consensus on July 15, 2003.

III.d. "State, federal, and private sources should be developed to increase the funding available for conservation easements on lands in close proximity to the upper Yellowstone River."

Conservation easements was a topic that came up again and again during Task Force deliberations. Although Task Force members acknowledged that existing conservation easement programs are already in place, this recommendation is a statement that those programs are not necessarily working for landowners in Park County. What was specifically stated is that existing programs need to go further—pay more per acre—in Montana counties where land values have skyrocketed in recent years. It was recommended that available monies (state, federal, and private) be pooled as a way to adequately compensate landowners along the upper Yellowstone River at market values for easements.

Photo 25. Looking down on Livingston from east bank of river. Photo by E. Galli-Noble.

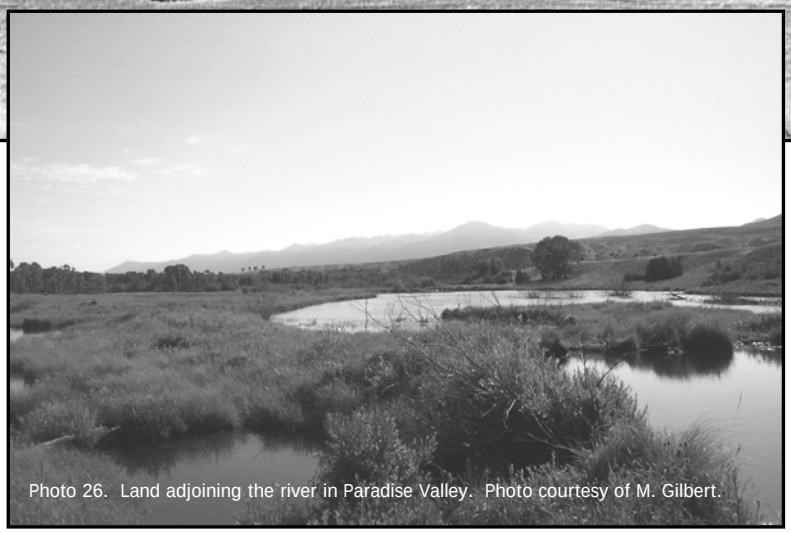

Photo 26. Land adjoining the river in Paradise Valley. Photo courtesy of M. Gilbert.

Recommendation III.d. deliberations: This recommendation was proposed and reached consensus on July 29, 2003.

III.e. "A study should be conducted to determine the feasibility of creating a voluntary, market-based program to remove, relocate, or redesign bank stabilization structures by allowing transfers of, and trade in, state and federal bank stabilization permits between willing parties."

Tradable permit programs have been introduced into many regulatory regimes over the past several decades, and such tradable permit programs have successfully leveraged the competitive efficiencies of the free market to achieve regulatory and social goals. This Task Force proposal encourages the Governor and federal and state agencies to investigate the feasibility of implementing such a tradable permit system for bank stabilization structures on the upper Yellowstone River. Such a program might allow, for example, environmental groups to purchase and retire bank stabilization permits held by landowners; or landowners could purchase permits from one another, thereby removing bank stabilization structures from one locale and replacing the removed structure in a new location that is in more immediate need. Such a program, if developed and implemented on the upper Yellowstone River, could serve as a model or pilot program for wider application in Montana and elsewhere.

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Recommendation III.e. deliberations: This recommendation was proposed and reached consensus on August 5, 2003.

III.f. "A grant writer should be engaged by the Montana Department of Fish Wildlife and Parks, the Governor's Office on Economic Development, City of Livingston, and Park County to pursue funding for projects of joint interest related to the upper Yellowstone River."

The intent of this recommendation was to seek grant sources that would help fund river-related projects and thus, take some of the tax burden off of the local residents. Several governmental entities, state and local, were identified as obvious collaborative partners when engaging a grant writer focusing on river-related issues and economic development in Park County.

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Recommendation III.f. deliberations: This recommendation was originally proposed and reached consensus on August 12, 2003.

IV. FISH / FISHERIES

IV.a. "Annual fish population surveys should be conducted on all sections where they have historically been made. If indications of a declining population trend are detected, additional studies must be implemented to identify potential causes and recommend actions that will restore populations."

As part of this recommendation, the Task Force agreed that historic fisheries management work has been important on the upper Yellowstone and it should continue in the future. They also recommended that if declining populations trends are detected as a result of annual fish population surveys, additional studies must be implemented to determine the potential cause(s) of the decline and actions must be recommended to restore those diminished populations. Task Force members made a point to emphasize that this was to be a response to declining trends outside the historic norms.

The Task Force acknowledged that annual fish sampling is already being accomplished on the upper Yellowstone River by the local Montana Department of Fish Wildlife and Parks (FWP) fisheries biologist, and Task Force members stated emphatically that that work should continue. During deliberations, the Task Force went on to say that in the past when word of possible FWP budget cuts have arisen, the local fisheries biologist position was oftentimes targeted for elimination. Consequently, they further emphasized that the fisheries biologist position was vitally important and it too should be sustained.

Finally, several members also cautioned that they were adamantly opposed to restocking as a method of restoring fish population numbers, if a declining trend was detected; while others, countered that historically, the FWP has been an advocate for wild trout management and they were confident that that would continue.

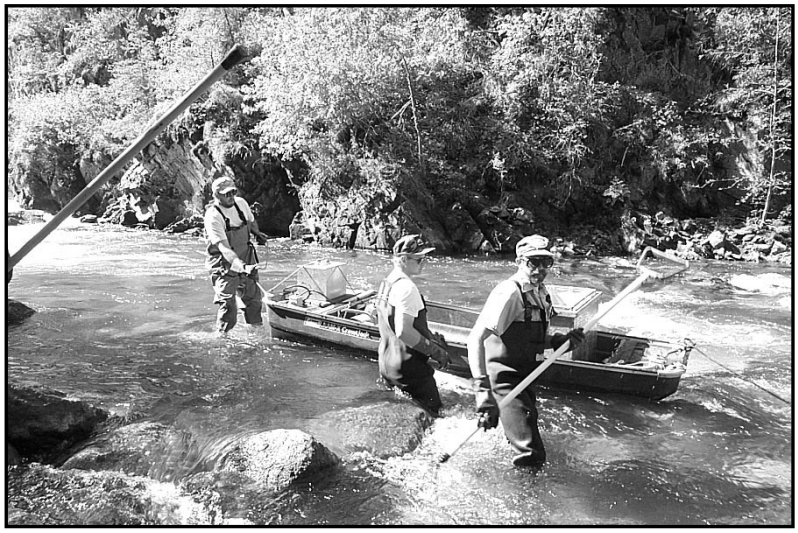


Photo 27. Montana FWP conducting annual fish sampling. Photo by E. Galli-Noble.

Recommendation IV.a. deliberations: This recommendation was originally proposed and reached consensus on July 8, 2003.

IV.b. "Further investigations into the production and rearing of juvenile fish in the upper Yellowstone River should be conducted, particularly to determine the relative importance of lateral side channels, mainstem habitats, overflow habitats, and spring creeks."

The idea behind this recommendation is tied to results from the fish populations study and the fish habitat study (Reports 4 and 5, respectively). The fish population study team conducted their sampling in 2001 and 2002, both of which were low-water years. The team made some assumptions about how fish are using side channels, but were unable to adequately address the issue due to timing constraints and flow conditions. Thus, in this recommendation, the Task Force stresses the need to further investigate the importance of main channel habitats, overflow habitats, and lateral side channel habitats for juvenile salmonids.

One of the other things that came out of the fisheries studies is how little is known about the role of the spring creeks for fry production and juvenile rearing in the Upper Yellowstone River Study Area. The suspicion is that the spring creeks are critical habitat, but it is still not known what role they actually play and to what degree.

Additional sampling during years with higher discharges both along main channel banks and in side channels would allow inference about the applicability of the fish populations study findings under more "normal" conditions. It would also provide managers with an understanding of which habitats—tributaries, spring creeks, backwaters, side channels, or upstream reaches—actually produce the juvenile fish. Side channels may be important natural nursery habitat for juvenile salmonids in the Yellowstone River system, considering the relative paucity of boulders, large woody debris, and other cover and roughness elements along the main-channel banks of the river. The role of side channels may be especially important during runoff when shallow, low-velocity habitat is negligible along the main channel and is present primarily in the side channels and overbank areas (Report 4, page 15; Report 5, page 24).

Photo 28. Fish population study team collecting side-channel data. Photo courtesy of MSU.

Photo 29. Upper Yellowstone River side channel. Photo courtesy of MSU.

Recommendation IV.b. deliberations: This recommendation was originally proposed and reached consensus on July 8, 2003.

IV.c. "New irrigation projects should consider fish-friendly construction and management in their design."

The Task Force acknowledged that fish populations may be impacted by irrigation activities, when the fish swim down the ditches and are unable to get back to the stream. There are techniques available that can help alleviate those problems; and consequently, the Task Force recommended that new irrigation projects should consider fish-friendly construction and management in their designs.

The Task Force made it clear in their deliberations that this recommendation applies only to new irrigation projects receiving public funding. The intent of this is not to require existing operations (for example the Livingston Ditch) to incorporate fish-friendly devises anytime they perform maintenance on their ditch. Rather, it is recommending that new projects consider fish-friendly elements in their initial project design, which oftentimes is much cheaper to do than retrofitting existing structures for things such as fish passage or screening.

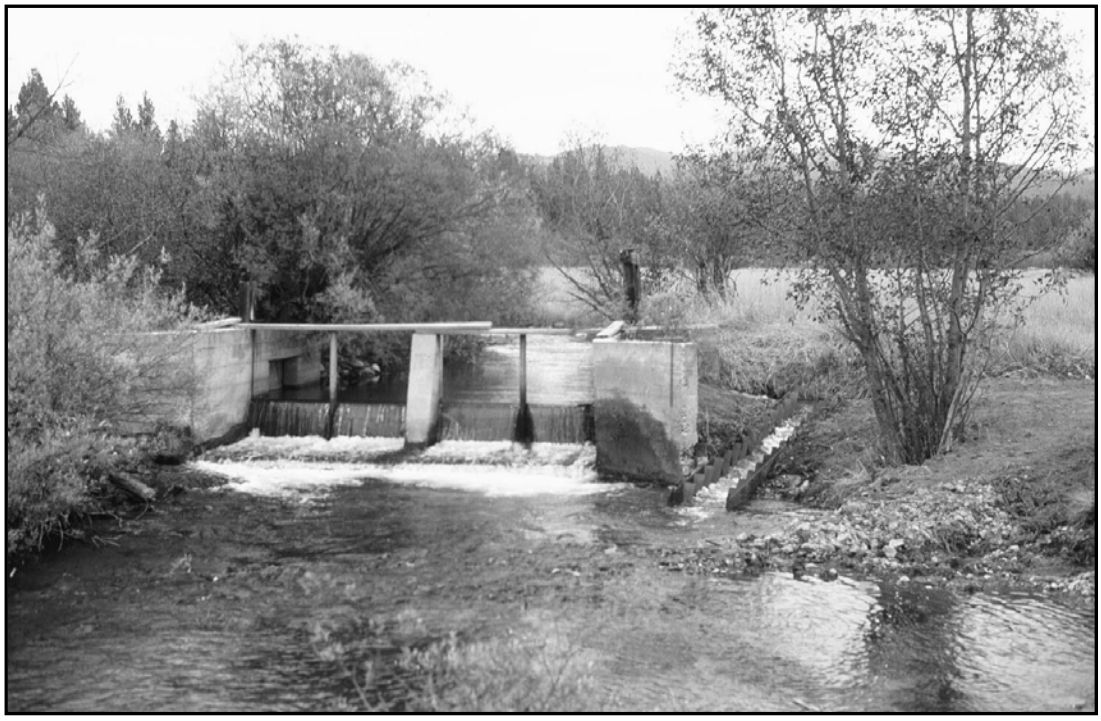


Photo 30. Example of a fish-friendly devise. Photo courtesy of B. Wiltshire.

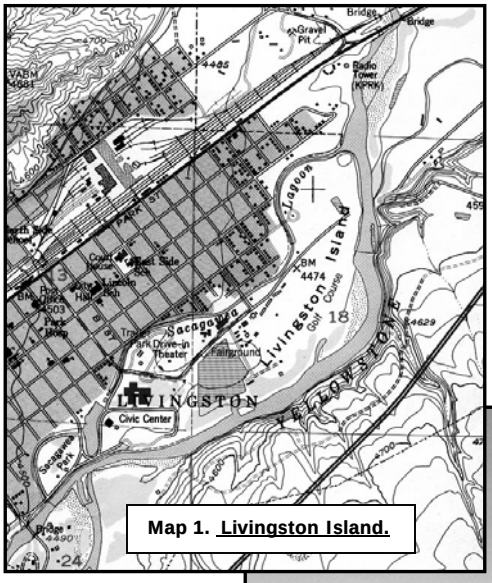
Recommendation IV.c. deliberations: This recommendation was originally proposed and reached consensus on August 12, 2002.

V. FLOODPLAIN DEVELOPMENT

V.a. "No additional Livingston public schools should be constructed on Livingston Island (also known as McLeod Island)."

This recommendation intentionally draws attention to the fact that crucial infrastructure in the City of Livingston and Park County is located in the Yellowstone River flood plain and floodway. Although other recommendations proposing floodplain development restrictions were brought forward, only this one, specifically targeting public schools, reached consensus.

In their deliberations, the Task Force strongly emphasized that only newly built, public schools are at issue in this recommendation. The recommendation does not apply to private schools (such as Saint Mary's School), nor does it apply to expansions, additions, or improvements made to existing schools located on Livingston Island.



Map 1. Livingston Island.

The thought behind this recommendation is that of long-term planning and the need to stop building important public structures on what was historically an island in the Yellowstone River. Task Force members acknowledged that the implementation of this recommendation will likely not happen for several decades, but stressed that the time is now for the community to start addressing the problems associated with public structure flooding and the costs associated with having to protect those structures from flood waters.

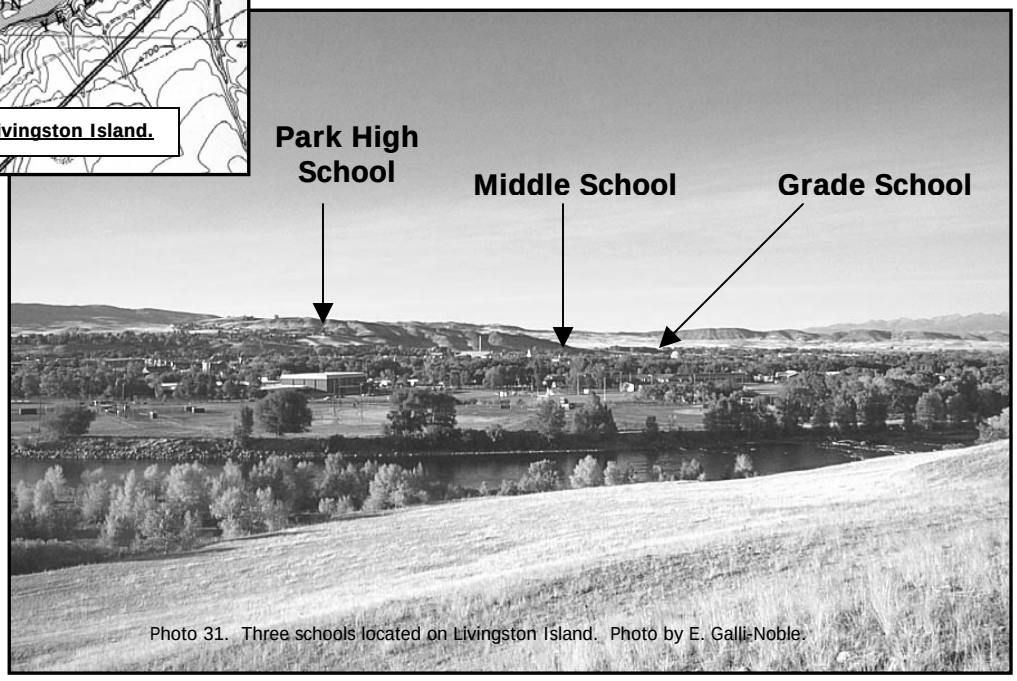


Photo 31. Three schools located on Livingston Island. Photo by E. Galli-Noble.

Recommendation V.a. deliberations: This recommendation was originally proposed and reached consensus on July 8, 2003.

VI. FUTURE SCIENCE / MONITORING / RESEARCH

VI.a. "The US Geological Survey-Helena and the US Geological Survey-Biological Resources Division should be encouraged to monitor and measure the effects of instream structures on the river over time."

From the beginning, one of the major focuses of the Task Force was bank stabilization and channel modification and their effects on the upper Yellowstone River. Although all of the studies have addressed bank stabilization to some degree, no conclusive findings were produced concerning the measurable impacts of specific instream structures. This is due for the most part to the short duration of the project and funding constraints. This recommendation recognizes that long-term monitoring—one to two decades, or more—will be required to provide conclusive information concerning instream structures and their impacts. Although it will be a long time in coming, the Task Force still feels strongly that it is vital information that will help landowners and the public make better decisions when considering future bank stabilization and channel modification options.

The US Geological Survey (Water Resources Division in Helena, and Biological Resources Division in Fort Collins, Colorado) was chosen to carry out the work in this recommendation specifically because they are not a regulatory agency, and measuring and monitoring is what they do best. The Task Force has worked closely with a multitude of local, state, and federal agencies over the years, including the USGS-WRD and BRD, and they consciously selected the USGS as the most appropriate agency to conduct this monitoring work.

Photo 32. USGS-WRD team conducting cross section work. Photo courtesy of USGS.

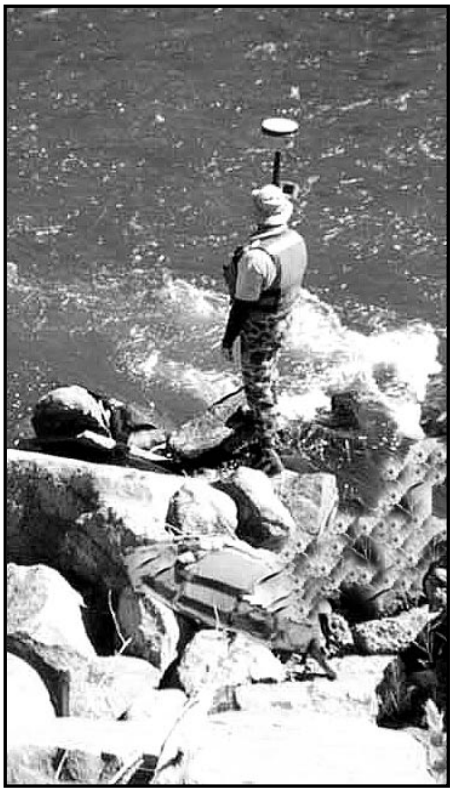


Photo 33. USGS-BRD team conducting survey work. Photo courtesy of USGS.

Recommendation VI.a. deliberations: This recommendation was originally proposed and reached consensus on July 8, 2003.

VI.b. "The Natural Resource Information System (NRIS) should house all Task Force Geographic Information System (GIS) information."

The Task Force recommended that one entity should house all of the GIS information collected on the upper Yellowstone River project; that is, a single location be chosen where the public could go with ease to access Task Force reports, maps, photos, tables, survey data, and the like. Given that the upper Yellowstone River effort was directed by the Governor's Office, the Natural Resource Information System (NRIS) in Helena seemed to be the appropriate state agency to take on this effort.

The intent of the Task Force is that NRIS, as the Montana GIS Library and Clearinghouse, to work collaboratively with other Task Force project partners—such as the US Army Corps of Engineers (Omaha) and the US Geological Survey—to get project information into the hands of Montanans, in particular the citizens of Park County.

Over the past five years, NRIS has assisted Task Force project partners by putting their research products, such as the 1998 Physical Features Inventory (Report 1), into a user-friendly, interactive application. In addition, NRIS recently developed the Yellowstone River Corridor Resource Page (nris.state.mt.us/yellowstone) a GIS user interface, which enables the public to query and locate GIS information from all Yellowstone River efforts. The NRIS could expand this already established Yellowstone effort to house and disseminate upper Yellowstone River GIS data produced for the Task Force.

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Recommendation VI.b. deliberations: This recommendation was originally proposed and reached consensus on July 22, 2003.

VI.c. "A study should be conducted to understand the river dynamics and hydrology related to sloughing of river banks at Deep Creek, the Weeping Wall, and Mallards Rest."

In their investigations, the geomorphology study team (Report 10; pages 36 and 37) addressed the major sediment sources of the upper Yellowstone River; but their findings were limited in scope and somewhat confounding to the Task Force members. Consequently, the Task Force recommended that a much more focused study be conducted to better understand the river dynamics and hydrology related to three highly-erosive river banks—at Deep Creek, the Weeping Wall, and Mallards Rest. This additional effort would build on the data already collected by the geomorphology research team, while also providing clarity for landowners who are struggling to understand the effects that these massive sediment sources may be having in their areas.

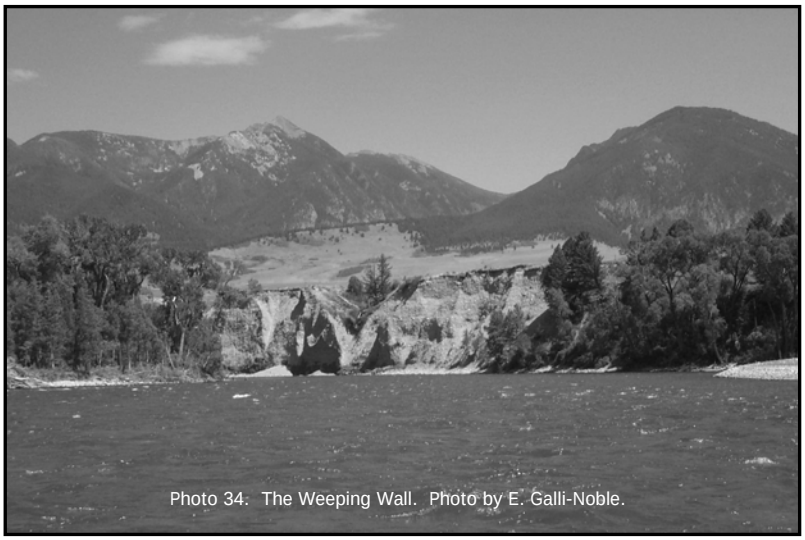

Photo 34. The Weeping Wall. Photo by E. Galli-Noble.

Photo 35. Mallards Rest. Photo courtesy of DNRC.

Photo 36. The Weeping Wall. Photo courtesy of DNRC.

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Recommendation VI.c. deliberations: This recommendation was originally proposed and reached consensus on July 22, 2003.

VI.d. "A study should be funded to identify the current conflicts and potential future conflicts arising from changing uses of the upper Yellowstone River."

This recommendation was in direct response to the socio-economic study findings concerning the perception by the local community that there may be an emerging overuse problem on the Yellowstone River (Report 3, Task 2, pages 5 to 8). The socio-economic study team focused on the economic impact associated with overuse of the river, and did not find one. But the study did not address the social impact of overuse or future competing uses of the river. Consequently, the Task Force recommended that a study be funded to identify current uses and conflicts on the river. Further, the Task Force stressed that potential future conflicts arising from changing river uses—including increase in use—needed to be identified and planned for by the local community. Task Force members felt that the social values people place on river use and the social impacts of its overuse need to be investigated and documented.

Report 3 (Task 2, pages 5 and 8) states that overuse of the river and its potential to degrade the aesthetics and the recreational values of the river was a concern of almost all stakeholders groups interviewed in the socio-economic investigation. It was the single most strongly held view related to use that came from the stakeholder interviews. The socio-economic study found that there are conflicting perceptions related to Yellowstone River use. Whereas overuse was a concern to most, one stakeholder group pointed out that the river's use must be promoted more to visitors in order to grow the economy. A number of groups believed that over development on the banks along the riverbanks threatens the river, while others pointed out that the ability to develop on the riverbanks preserves high property values.

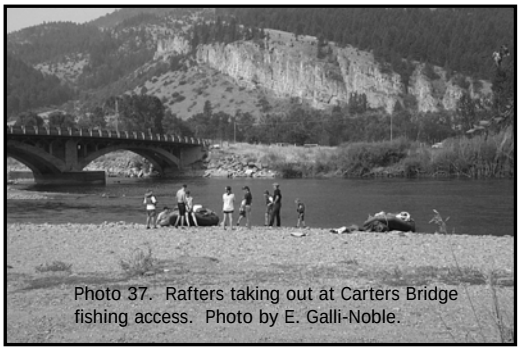

Photo 37. Rafters taking out at Carters Bridge fishing access. Photo by E. Galli-Noble.

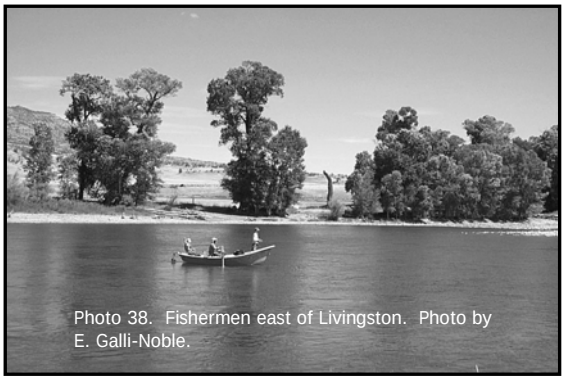

Photo 38. Fishermen east of Livingston. Photo by E. Galli-Noble.

Photo 39. A familiar summer scene in Livingston. Photo by E. Galli-Noble.

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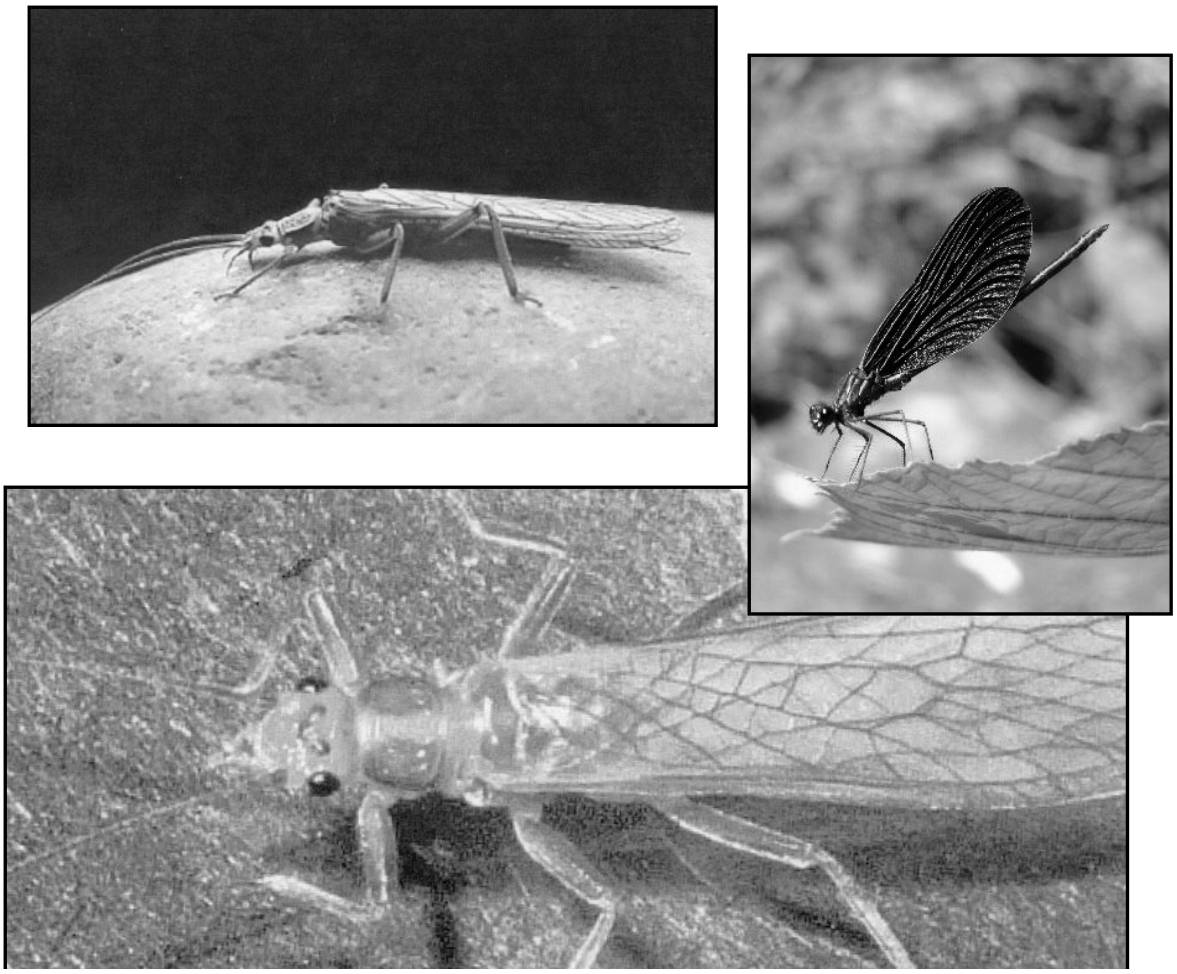
Recommendation VI.d. deliberations: This recommendation was originally proposed and reached consensus on July 22, 2003.

VI.e. "The development and maintenance of a long-term database of macroinvertebrate populations should be encouraged to monitor water quality in the Yellowstone River."

Task Force researchers did not address water quality directly in their river investigations. There are limited water-quality sampling efforts being conducted in the upper Yellowstone currently, but none of these efforts are comprehensive, nor are they long term. Given the economic and ecologic importance of maintaining and improving the river's health, and the fact that macroinvertebrates are an excellent indicator for water quality and are the primary biological indicator for many river studies, the Task Force recommended that a long-term database of macroinvertebrate populations be developed and maintained to monitor water quality in the Yellowstone River. Their intent is that this database will be the mechanism to alert the community to deleterious changes in the system, before those changes are insurmountable.



Photos 40, 41, 42. Macroinvertebrates. Photo sources unknown.

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Recommendation VI.e. deliberations: This recommendation was originally proposed and reached consensus on July 29, 2003.

VI.f. "The drilling site known as Hobbs Well should be thoroughly investigated to determine what, if any, impacts it has created, or may create, on subterranean and surface water flows."

A private citizen from the Pray, Montana area brought this issue before the Task Force, both in writing (May 16, 2003) and in person at the July 29, 2003 Task Force meeting. According to this individual—which he stated is verifiable from the well log housed at the Oil and Gas Commission office in Billings and a copy is in his possession—a test oil well was drilled on the Pray flats (near the present location of the Arrowhead School) by the Montana Power Company in the early 1980s. After drilling about 4,500 feet, through the known hot water aquifer, the drill went through "an eggshell" and into a hollow cavity, essentially draining the hot water aquifer. Realizing a problem, the drill crew plugged the hole, and eventually the project site was abandoned.

The Task Force was asked to recommend an investigation of this "potentially harmful situation;" specifically to determine if the bottom seal actually took and is still intact today. Although limited by the amount of information received, the Task Force members agreed that this situation should be looked into, to determine what, if any, impacts the Hobbs Well has created, or may create in the future, on subterranean and surface water flows in Paradise Valley.

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Recommendation VI.f. deliberations: This recommendation was originally proposed and reached consensus on July 29, 2003.

VI.g. "People should be encouraged to study different techniques or ways to alleviate the flooding damage through the Upper Yellowstone River Study Area."

The intent of this recommendation is to encourage the community to start thinking in a new direction when it comes to flooding and flooding damage—to look to a future that is different than today. The Task Force recommended that people study different techniques or ways to alleviate flooding damage on the upper Yellowstone River. Early-on in their deliberations, Task Force members were going to apply this recommendation exclusively to the urban (Livingston) reach of the river; but after extensive discussion, all agreed that it would be appropriate to apply it to the full Upper Yellowstone River Study Area (Gardiner to Springdale, Montana).

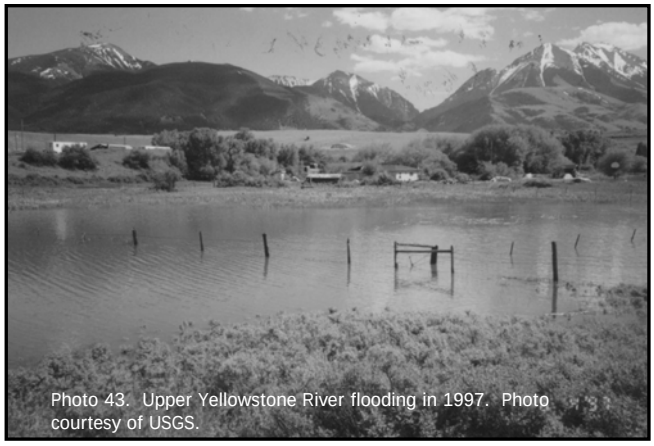

Photo 43. Upper Yellowstone River flooding in 1997. Photo courtesy of USGS.

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Recommendation VI.g. deliberations: This recommendation was originally proposed and reached consensus on July 8, 2003.

VI.h. "Regulatory program modifications for activities that affect the upper Yellowstone River should be considered in the context of the Governor's Upper Yellowstone River Task Force scientific investigations."

Through this recommendation, the Task Force went on record stating that regulatory program changes for activities that affect the upper Yellowstone should be considered in the context of the science generated by their research investigations. Said another way, the Task Force hopes that in the future regulatory agencies consider the science generated from the upper Yellowstone River project when making management decisions that will affect the upper Yellowstone River. They fully recognize that economics and politics also play a role in the decision-making process, but are simply stressing the need to consider the biophysical components of the system as well.

In addition, Task Force members stated that this recommendation is not meant to be exclusive; they are not saying that only Task Force findings should be considered. Quite to the contrary, they have recommended that research on the river continue and that new scientific investigations be funded and conducted; hopefully building on the comprehensive base that the Task Force has established. Follow up research recommended by the Task Force is outlined in many of the IV Future Science/Monitoring/Research recommendations.

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Recommendation VI.h. deliberations: This recommendation was originally proposed and reached consensus on August 12, 2003.

VI.i. "A river migration study should be undertaken to measure the potential for river channel avulsion between the Livingston Ditch headgate and Interstate 90, and to identify measures which could be implemented to prevent flood damage to the Livingston urban area."

This recommendation was brought forth by the City of Livingston. In it, the Task Force stresses the need to conduct a study that evaluates the potential for river channel avulsion in the Livingston urban reach (from the Livingston Ditch headgate to Interstate 90), a serious concern for City managers and many private landowners within that reach. The recommendation goes on to suggest that measures should be identified that would help prevent flooding damage in developed areas within the urban river reach.

One thing that spurred on this concern was a comment made by the riparian trend analysis team (Report 9) in January 2003, which indicated that more information was required to do a thorough analysis of this particular river reach. The researchers also stated that cottonwoods were established behind Albertson's Food Center (2120 W. Park Street; formally Buttrey's) and that the river likely used to be located there. With the construction of Interstate 90, the direction of flood flows could be backed-up and then channelized down Park Street (Highway 89 South), which leads to the heart of Livingston's downtown. This fact is of grave concern to the City and compelled them to sponsor this recommendation.

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Recommendation VI.i. deliberations: This recommendation was originally proposed and reached consensus on August 12, 2003.

VI.j. "The State of Montana, along with federal sources, should fund an Upper Yellowstone Research and Monitoring Program to coordinate efforts by agency personnel, universities and researchers, and the community to develop and implement a long-term research and monitoring program in the upper Yellowstone River study area."

The discussion that led to this recommendation began when Task Force members asked their Technical Advisory Committee (TAC) if there was a way to document change in the system; if there is a timeframe whereby biophysical comparisons could be made; and if impact thresholds could somehow be detected or established?

The response from the TAC chair (Dr. Duncan Patten) was that each of the river system components studied by the Task Force has a different threshold. However, by establishing a monitoring program, components of the system could be observed over time. Some components would require monitoring on a regular basis, while others may only need to be checked every five years; thus, providing the detail of information needed to indicate when you are reaching a critical threshold.

That said and taking into account the many follow-up research proposed by the Task Force, the Task Force recommended that the State of Montana and federal sources fund an Upper Yellowstone River Monitoring Program to implement long-term research and monitoring in the basin and to coordinate research efforts undertaken by agencies, the local community, and the scientific community. It was also acknowledged that new research efforts would likely be undertaken in the future that the Task Force cannot envision at this point in time, so language was added to this recommendation to leave new research options open.

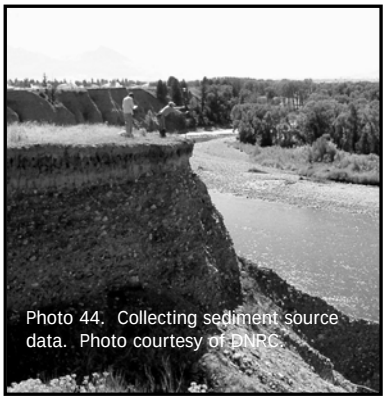

Photo 44. Collecting sediment source data. Photo courtesy of DNRC.

The Task Force did not identify a specific locale or entity to lead this coordination effort. Although, Montana State University and the School of Mines and Engineering (Montana Tech of the University of Montana) were identified as universities that have already conducted extensive research studies in the upper Yellowstone.

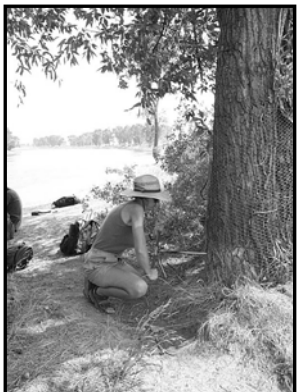

Photo 45. Aging a cottonwood tree. Photo by E. Galli-Noble.

Photo 46. Collecting juvenile fish data. Photo courtesy of MSU.

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Recommendation VI.j. deliberations: A recommendation proposing the establishment of an Upper Yellowstone Research and Monitoring Program was originally proposed on July 29, 2003. Subsequently and upon reflection, the Task Force reconsidered aspects of the July 29th recommendation and proposed a new recommendation addressing the same idea, adding a funding component to the recommendation that then reached consensus on August 12, 2003.

VII. NEW STAKEHOLDER GROUP

VII.a. "Stakeholder group(s) should be developed, with full public participation, to continue to monitor the status of the upper Yellowstone River, to make recommendations about river-related issues, to encourage long-term monitoring of river-related projects, to promote the completion of identified research needs, and to examine the implementation of the Governor's Upper Yellowstone River Task Force recommendations."

The Task Force heard from many members of the community—as well as its governmental partners, including the Governor's Office—that they would be remiss not to address the issue of who is going to take the lead in the upper Yellowstone once the Task Force has ended. Although Task Force members emphasized that they did not want to dictate what the make up of new leadership would be, nor what specific issues the new leadership would take on, in this recommendation the Task Force did acknowledge that it is very important that some sort of diverse stakeholder group or groups be developed. They went on to recommend that the new group or groups—developed with full public participation—continue the work that the Task Force set in motion.

Finally, during deliberations, Task Force members stressed that an important role for this future stakeholder group(s) is to provide a local voice and citizen input and leadership, in the many actions that are scheduled to take place in the Upper Yellowstone River Basin in the near future.

Photo 47. Post flood activity. Photo by J. Bailey.

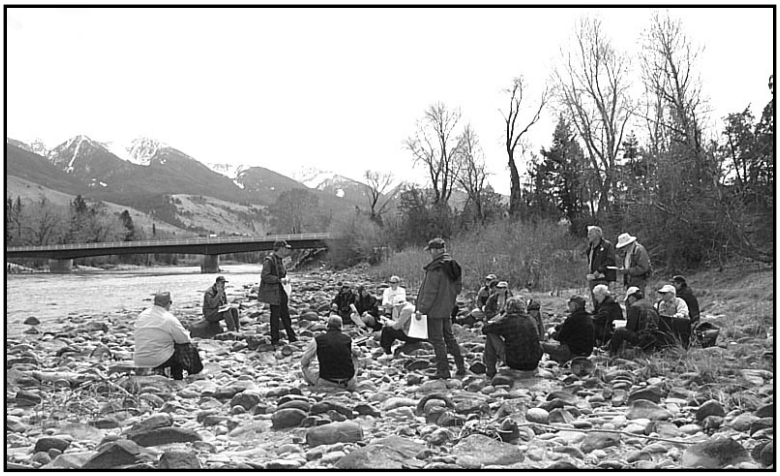

Photo 48. Educational workshop for the public. Photo by E. Galli-Noble.

Recommendation VII.a. deliberations: This recommendation was originally proposed and reached consensus on July 29, 2003.

VIII. NINTH STREET ISLAND

VIII.a. "Implement a solution that minimizes cumulative impacts to achieve hydraulically-balanced water surface elevations, with little or no backwater, in the channels separated by Ninth Street and Siebeck Islands."

The Task Force agreed that the "isthmus" or road separating Ninth Street and Siebeck Islands is problematic, and perhaps more specifically there is a need to achieve hydraulically-balanced water surface elevations in the channels separated by the Ninth Street and Siebeck Island road. There was concern over the fact that water surface in the east channel is several feet higher than in the west channel at the same discharge. The reason for this is that the west channel is aggrading on the order of four to six feet over the past 30 years—based on cross-section comparisons between 1974 and 2002 that the geomorphology team conducted.

The words "with little or no backwater" were added to the recommendation because the Task Force agreed that there is basically a dam being created by the road, and that damming effect (a) increases flow in the western channel allowing sediment to be carried through the reach, and (b) decreases flow in the other, eastern, channel causing sediment to be deposited in the reach. An hydraulic imbalance is thus created.

When final approval of this recommendation was discussed, the words "minimize cumulative impacts" were also added. By doing so, the Task Force was acknowledging that there could be potential negative impacts to landowners—upstream and downstream—depending on the solution applied. They therefore stated that any action taken when trying to achieve hydraulically-balanced water surface elevations at this site should minimize cumulative impacts.

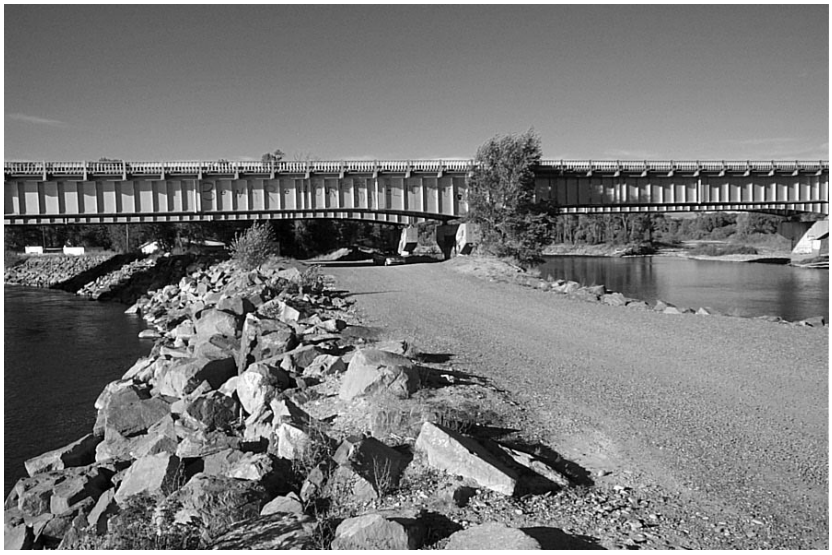

Photo 49, left. Interstate 90 Bridge and road between Ninth Street and Siebeck Islands. Photo by E. Galli-Noble.

Photo 50, above. Photo of 1996 flood. Photo by J. Bailey.

Recommendation VIII.a. deliberations: This recommendation was originally proposed and reached consensus on June 2, 2003.

VIII.b. "Park County should be encouraged to develop a free-span bridge to Ninth Street Island and to pursue such a bridge through the Department of Transportation's Adopt-A-Bridge-Program or any other funding source."

The Ninth Street Bridge is owned and maintained by Park County. This recommendation encourages Park County to replace the present bridge, which all agreed creates a major safety hazard for recreationalists on the river, with a free-span bridge to Ninth Street Island.

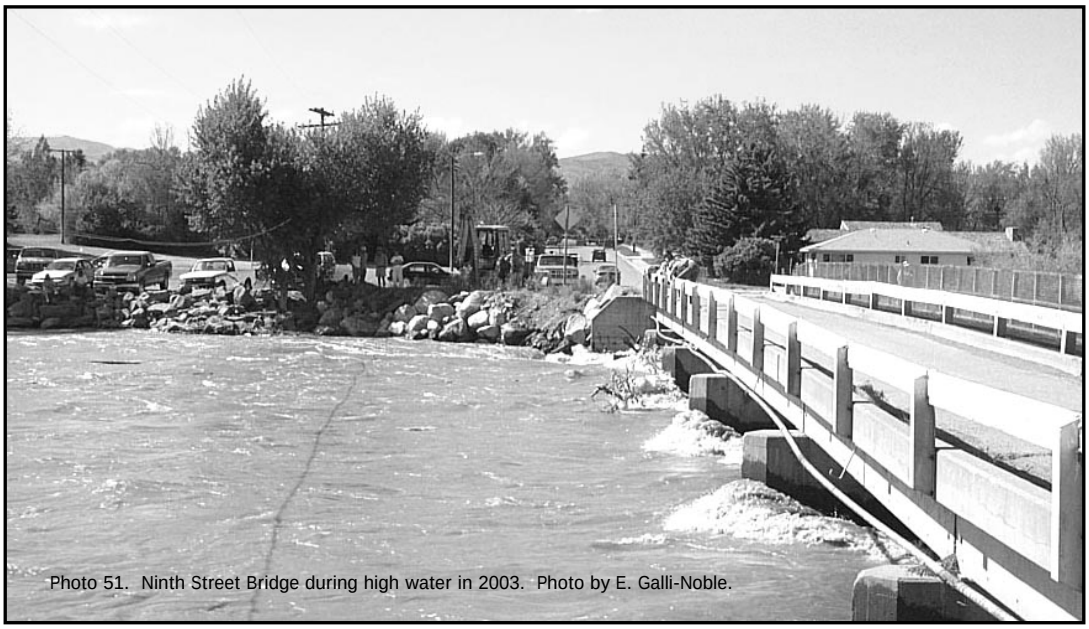

Photo 51. Ninth Street Bridge during high water in 2003. Photo by E. Galli-Noble.

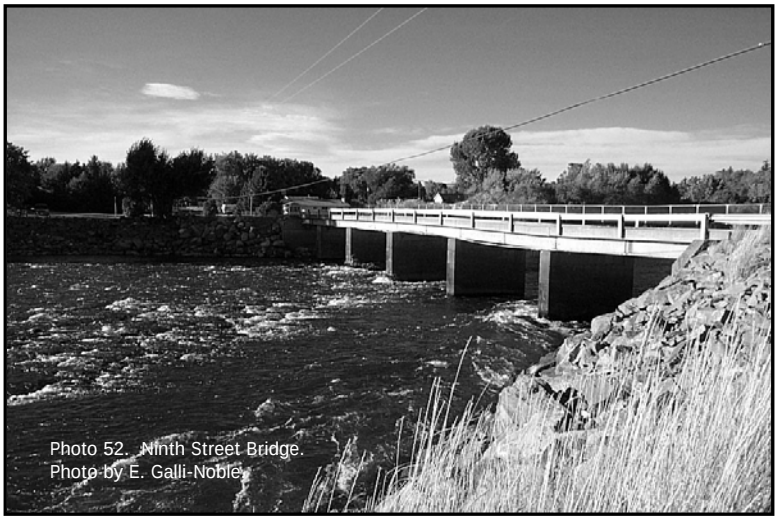

Photo 52. Ninth Street Bridge.
Photo by E. Galli-Noble.

Recommendation VIII.b. deliberations: This recommendation was originally proposed and reached consensus on August 12, 2003.

IX. NOXIOUS / INVASIVE PLANTS

IX.a. "Additional studies should be designed and conducted to document the proliferation of noxious or invasive plants along the river corridor, and to evaluate the impacts on fish, wildlife, water quality, soil and bank stability, and economic productivity; and programs that monitor and reduce invasive plant infestations should be supported."

Task Force members commented that noxious or invasive plants are a "sleeper" issue that the Task Force never directly addressed in any of their research investigations. All agreed that the proliferation of noxious or invasive plants could be a major threat to the river system and its impacts are not well understood. Therefore, the Task Force recommended that additional studies be designed and conducted to document the proliferation of noxious or invasive plants along the river corridor, and to evaluate the impacts on fish, wildlife, water quality, soil and bank stability, and economic productivity. In addition to studies, the Task Force also recommended that existing programs that monitor and reduce invasive plant infestations should be supported.

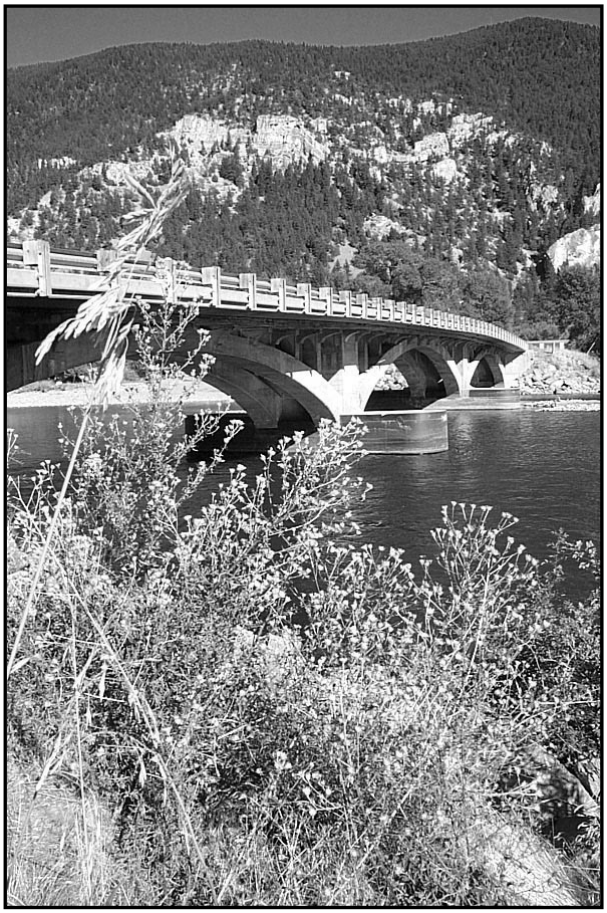

Photo 53. Knapweed at Carters Bridge. Photo by E. Galli-Noble.

Photo 54. Leafy spurge. Photo source unknown.

Recommendation IX.a. deliberations: This recommendation was originally proposed and reached consensus on June 2, 2003.

X. PERMITTING / REGULATORY / MANAGEMENT DECISIONS

X.a. "The streamlined uniform permit application process among local, state, and federal permitting agencies should be continued and, when possible, improved."

Presently, there is a Joint Application for proposed work in Montana's streams, wetlands, flood plains, and other water bodies. The single application includes sections that cover requirements for all of the following: 310 Permit (local conservation district), SPA 124 Permit (FWP for government use only), Floodplain Permit (County), Section 404/Section 10 Permits (US Army Corps of Engineers), 318 Authorization (DEQ), and Navigable Rivers Land Use License/Easement (DNRC).

Through this recommendation, the Task Force acknowledges that the streamlined uniform permit application process has been successful. It has made the permit requirements needed for specific actions easier for landowners to understand. Using one form to address many agencies' informational requirements has also made it much less time consuming for permit applicants. That said, there is always room for improvement. Consequently, the Task Force also states in this recommendation that when possible—with feedback from applicants and regulatory agency personnel administrating the permits—the application should be improved.

***Additional information provided to the Task Force in October 2003*:** It should be noted that the Joint Application form was recently reviewed by agency partners, and a new and "hopefully improved" version of that form was released for statewide use in October 2003.

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Recommendation X.a. deliberations: This recommendation was originally proposed and reached consensus on May 22, 2003.

X.b. "All permitting and/or management decisions (including the Special Area Management Plan) on the upper Yellowstone River should thoroughly consider and must recognize and respect:

1. **the function of the flood plain, including but not limited to: connectivity between the river channel and the flood plain; regeneration of cottonwoods and other riparian vegetation; and maintenance of side channel habitat for spawning and juvenile fish; and**
2. **the public and private interest in protecting private property and important social, economic, and natural resources existing on or near the flood plain; and**
3. **the geomorphology of particular river reaches and their different inherent characteristics."**

This recommendation is a direct reflection of how the Task Force applied their aphorism of "letting science lead their process." In bullets #1 and #3, the Task Force highlighted the findings of several biophysical scientific investigations, and stressed that future permitting and management decisions consider, recognize, and respect these crucial river system components and functions. They provide a balance, in bullet #2, by highlighting the social and economic aspect of the issue; they stress the importance of thoroughly considering, recognizing, and respecting the public and private interest in protecting private property on or near the flood plain. This theme of providing balance when making management decisions—protecting the river resource, as well as private property rights—came up repeatedly during Task Force deliberations.

Photo 55. Livingston home. Photo by E. Galli-Noble.

Photo 56. Upper Yellowstone River Watershed, Paradise Valley. Photo by M. Gilbert.

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Recommendation X.b. deliberations: This recommendation is a combination of two original recommendations. The first was originally proposed and reached consensus on May 22, 2003, and the second was originally proposed and reached consensus on June 11, 2003. They were combined in Step 3 of the *Steps for Formal Action on Task Force Recommendations* on August 19, 2003.

X.c. " Policies should be continued that allow for the removal of large woody debris on a localized basis to protect public and private infrastructure, to assure public safety, and to allow side channel function when necessary."

In the wake of the 1996 and 1997 floods, one comment heard repeatedly by the Task Force was the need to get all the trees and debris out of the river. Five years later, the Task Force and members of the public have learned that large woody debris provides benefits to the ecology of the river system.

The Task Force was in agreement that problems can and do arise when large debris poses a threat to public and private infrastructure, such as the Ninth Street Bridge and irrigation headgates, as well as cutting off side channels. They specifically acknowledge those instances in this recommendation. They also state that policies should continue to allow removal of large woody debris, on a localized basis, to protect public and private infrastructure, to assure public safety, and to promote side channel function. The Task Force did not, however, go beyond that statement; they have come to understand that large woody debris plays a vital ecological role in the river system.

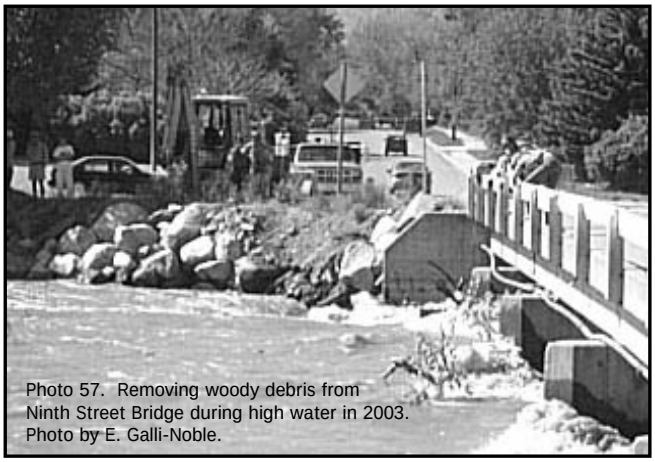

Photo 57. Removing woody debris from Ninth Street Bridge during high water in 2003. Photo by E. Galli-Noble.

Photo 58. Large woody debris east of Livingston. Photo by E. Galli-Noble.

Photo 59. Large woody debris. Photo courtesy of NRCS.

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Recommendation X.c. deliberations: This recommendation was originally proposed and reached consensus on July 22, 2003.

X.d. "Necessary dredging of sedimentation should be continued to maintain irrigation structures and canals."

This recommendation supported necessary dredging of sediment in order to maintain irrigation structures and canals. As was stated frequently during Task Force discussions, the community wants agricultural operations in Park County to remain viable. This recommendation acknowledged the need for agricultural producers to get water and maintain their irrigation structures, and no one on the Task Force objected to those activities continuing.

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Recommendation X.d. deliberations: This recommendation was originally proposed and reached consensus on July 22, 2003.

X.e. "The Montana Department of Fish, Wildlife, and Parks should develop an angling 'closure' matrix specifically designed to address any future severe conditions on the upper Yellowstone River to protect its unique characteristics including its fisheries and fish habitat."

Although admittedly somewhat redundant to the already existing Fish Wildlife and Parks Drought Fish Closure Policy (a general statewide policy), the Task Force felt it valuable to formally go on record as supporting that current policy. In addition, the Task Force went on to recommend that an angling closure matrix be developed specifically for the upper Yellowstone River. The matrix would address future severe conditions experienced on the upper Yellowstone, and would be based on, or seek to protect, the river corridor's unique characteristics including its fisheries and fish habitat. By focusing on an angling closure, the Task Force wanted to shed light on the unresolved issue of shifting angling pressure; that is, as select rivers close due to drought conditions, anglers simply move to unclosed rivers to recreate, creating increased pressure in those open rivers.

Photo 60. Fishermen on the upper Yellowstone River. Photo by E. Galli-Noble.

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Recommendation X.e. deliberations: This recommendation was originally proposed and reached consensus on July 29, 2003.

X.f. "The US Army Corps of Engineers should include in their 205 Study: (1) an investigation of widening the channel by resloping the north bank, in a stepped or terraced fashion, around cross sections #55,000 and #56,000 on the preliminary floodplain map, while maintaining a park-like environment; and (2) should identify, if possible, funding for mitigation of landfills if necessary."

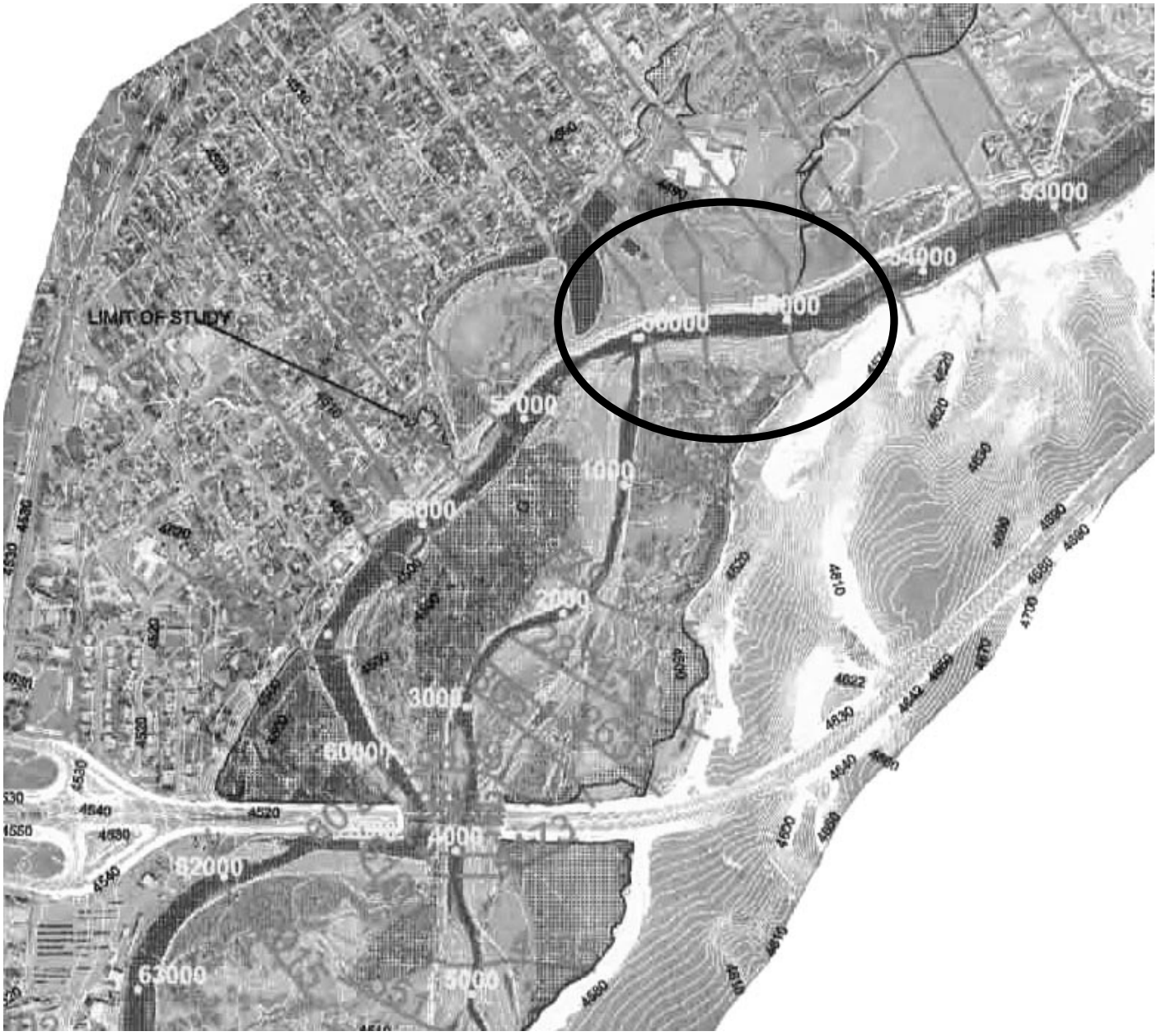
The US Army Corps of Engineers (Corps) is currently conducting a Section 205 Study—a study carried out before Flood Damage Reduction projects are undertaken (Section 205 of the Flood Control Act of 1948, as amended)—specifically to address the City of Livingston's levee. If the levee does not meet FEMA structural standards, the structures built behind the levee remain in the designated floodway, which jeopardizes Park County's and the City of Livingston's ability to stay in the Federal Floodplain Insurance Program.

This Task Force recommendation was proposed as one possible option, among many, that should be looked into by the Corps in their 205 Study. Specifically, the Task Force is proposing that an investigation into the response to widening the channel by resloping the north bank in a terraced fashion in the area of cross sections #55,000 and #56,000 be conducted (see *Map 2* on next page). This potentially could provide a wider channel and drop water elevations through town, which may in turn relieve flooding pressure in large flow events.

In addition, the Task Force went on to recommend that if this terracing of the bank was acted upon, a park-like environment should be maintained along the river (mature trees preserved and recreational areas retained). They also cautioned that several old landfills exist along the targeted riverbank, and because the Federal government typically does not participate in mitigation associated with existing landfills, funding for mitigation of those landfills should be identified.

The Task Force fully acknowledges that this may not be the solution to the levee issue in Livingston, but they definitely want to see a wide array of alternatives to be investigated in the 205 Study.

Photo 61. Road between the river and Sacajawea Park. Photo by E. Galli-Noble.



Map 2. Preliminary Floodplain Map. Circle indicates area of cross sections 55,000 and 56,000.

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Recommendation X.f. deliberations: This recommendation was originally proposed and reached consensus on July 29, 2003.

X.g. "Park County should be asked to join with the City of Livingston to co-sponsor the Section 205 Study in order to develop a comprehensive approach to structural and non-structural solutions to floodplain management issues in and around the City of Livingston."

Complementing the preceding recommendation (Recommendation X.f.), the Task Force agreed that the issues being addressed in the Corps Section 205 Study were not restricted to the Livingston city limits. They recommended that Park County be asked to join the City to co-sponsor the Corps 205 Study in order to develop a comprehensive approach to structural and non-structural solutions to floodplain management issues in the urban river reach. From the beginning, the Task Force has always advocated the community working together to address river issues.

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Recommendation X.g. deliberations: This recommendation was originally proposed and reached consensus on August 5, 2003.

X.h. "An analysis should be conducted to determine the feasibility of relocation and buyout options for property owners who are located or reside in the floodway in the Livingston area."

Given the fact that the new preliminary floodplain maps show many Livingston homes and businesses located in the flood plain and floodway, and at the request of the City of Livingston, the Task Force recommended that an analysis be conducted to determine the feasibility of relocation and buyout options for Livingston area property owners who are located or reside in the floodway. This is not a dictate that those property owners be relocated. Rather, it is a recommendation that an analysis be conducted to see if relocations or buyouts are feasible options for Livingston residents. Details of what a FEMA buyout would entail and whom it will affect need to be fully explored before it is accepted or thrown out as a viable option.

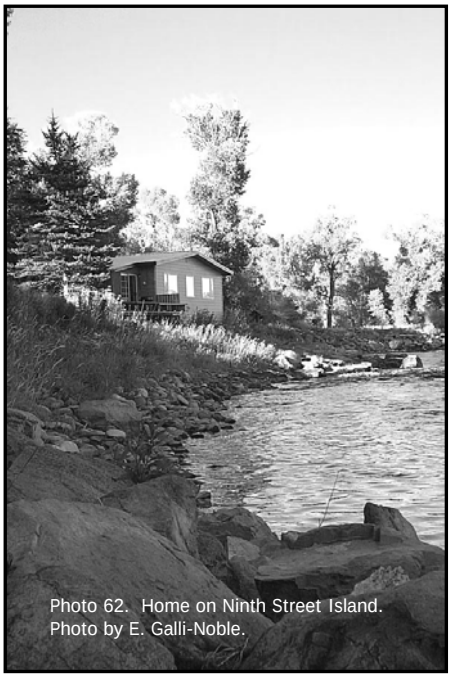

Photo 62. Home on Ninth Street Island. Photo by E. Galli-Noble.

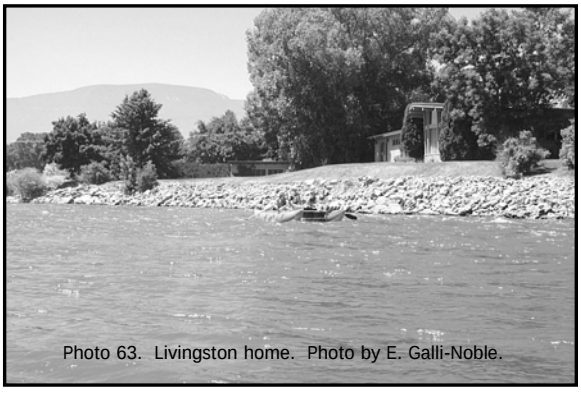

Photo 63. Livingston home. Photo by E. Galli-Noble.

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Recommendation X.h. deliberations: This recommendation was originally proposed and reached consensus on August 5, 2003.

X.i. "Mining and mining-related dredging should be prohibited in the active bankfull bed and banks of the upper Yellowstone River. Mining and mining-related dredging and sale of sand and gravel as a byproduct of bank stabilization, flood control, and maintenance of irrigation structures and canals are not prohibited under this recommendation.

The Task Force recommended that mining and mining-related dredging be prohibited in the active bankfull bed and banks of the upper Yellowstone River. They then made an exception for the dredging of sand and gravel, when extracted (and sold) as a byproduct of bank stabilization, flood control, and maintenance of irrigation structures and canals.

Task Force members went on record as stating that this was not an endorsement for commercial gravel mining operations on the river. Instead, this was an acknowledgment that agricultural operations currently are permitted to maintain their irrigation diversions, and the Task Force accepted the current approach. This again stresses the Task Force's desire to protect the long-term health and function of the river system, while at the same time supporting the local agricultural community and recognizing their operational needs.

Photo 64. Historic dredging operation. Photo source unknown.

Recommendation X.i. deliberations: This recommendation was originally proposed and reached consensus on August 5, 2003. Additional clarification language was added during final deliberations on August 25, 2003.

X.j. "The US Army Corps of Engineers should conduct a public scoping process during the development of the Special Area Management Plan for the upper Yellowstone River."

Through this recommendation, the Task Force is formally stating that the Task Force process and its deliberations are not in any way a substitute for the Corps' Special Area Management Plan (SAMP) public scoping process. Members of the public stated many times that they were concerned that the Corps was in some way trying to circumvent the NEPA process by using the Task Force project and recommendation process as a proxy for public input. The Corps has stated repeatedly that that is not the case. The Task Force made it clear in this recommendation that a public scoping process should be conducted during the development of the SAMP for the upper Yellowstone River.

Recommendation X.j. deliberations: This recommendation was originally proposed and reached consensus on August 12, 2003.

XI. PUBLIC STRUCTURES

XI.a. "Existing public structures that have undesirable impacts on the upper Yellowstone River's riparian system function should be modified or replaced, provided that such modified or replaced structures eliminate or mitigate those undesirable impacts with no significant adverse effects on existing public or private entities."

In this recommendation, the Task Force agreed that the issue of existing public structures is quite broad, and acknowledged the fact that many of these structures may have undesirable impacts on the river's riparian function, and consequently should be replaced or modified.

The concept behind this recommendation is directly tied to the findings of several scientific investigations, which concluded that bridges (Report 10, pages 39 and 40) and bank stabilization structures (Report 4, pages 15 and 16, and Report 9, pages 35 to 37) can have undesirable impacts on riparian system function by constraining the channel, simplifying the system's vegetation and geomorphology, cutting off floodplain and meander zones, and cutting off crucial side-channel flow. The fish habitat study (Report 5, page 24) states that channel modifications that result in reduced availability of side channel and overbank habitats, especially during runoff, will probably cause local reductions in juvenile abundances during the runoff period. As the amount of confinement increases, researchers expect a concomitant reduction in the area and persistence of slow, shallow current velocity habitat. As the availability of slow, shallow current velocity habitat becomes more and more responsive to changes in discharge, the researchers suggest that salmonid populations dynamics will become more variable over time.

The wildlife study (Report 8, page 25) states that "the maintenance of flood dynamics within the Yellowstone River may be the most important management activity for sustaining avian diversity within the flood plain. The current riparian bird community reflects the natural flooding regime, river dynamics, and riparian succession that characterize the Yellowstone River system. Birds inhabit the full suite of successional stages, and depend on the regeneration of vegetation to maintain this heterogeneous flood plain. Human activities, such as bank stabilization, that alter channel migration and overbank flooding are likely to inhibit riparian succession, leading to a homogenization of riparian vegetation, and a loss of structural and species complexity; this could be detrimental to local riparian bird communities. Furthermore, given that bird populations within the study area are likely linked to sub-populations in Yellowstone National Park (Hansen and Rotella 2002), decisions made on the private lands in the upper Yellowstone River system will likely have consequences considerable distances away on public lands."

In an effort to strike a balance, the Task Force also recognized that actions taken on the river—even if intended to enhance riparian system function—have the potential to adversely impact others downstream and upstream. That is, one action could simply be shifting the problem downstream to other private or public property owners. So they added the clause that undesirable structures should be modified or replaced, but only provided that such modified or replaced structures eliminate or mitigate those undesirable impacts with no significant adverse effects on existing public or private entities. Here again, the Task Force is stressed the need to

address these problems in a comprehensive manner, as a community, and not as independent actions by individual landowners.

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Recommendation XI.a. deliberations: This recommendation was originally proposed and reached consensus on June 2, 2003.

XI.b. "Any structural or non-structural modifications to the river bank through Livingston should blend with the environmental, cultural, and historic themes of the community to the extent possible."

Task Force members, in particular the Livingston City Commissioners, have heard from the citizens of Livingston that structural or non-structural modifications made along the river bank in the urban reach should blend with the park-like environment of Sacajawea Park and other historic and cultural themes of the community. This is particularly pertinent given that several major projects are scheduled for the Livingston reach in near future—required modifications of the city's levee and the replacement of the Highway 89/10 South Bridge in 2008.

These efforts have the potential to enhance the community if care is taken that they blend with the environmental, cultural, and historic themes of the community. The Task Force supports the idea that the citizens of Livingston have an active voice as these projects progress and that they help their governmental project partners (FEMA, the Corps, and Montana Department of Transportation) make decisions that are beneficial and welcomed by the members of the community.

Photo 65. Livingston levee with low water. Photo by E. Galli-Noble.

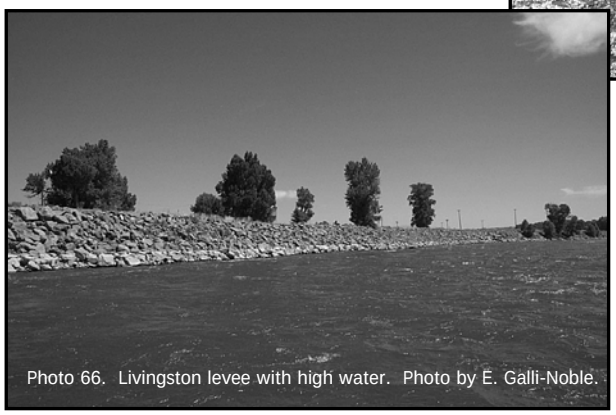

Photo 66. Livingston levee with high water. Photo by E. Galli-Noble.

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Recommendation XI.b. deliberations: This recommendation was originally proposed and reached consensus on August 5, 2003.

XI.c. "Construction of a flood control dam and impoundment on the mainstem of the Yellowstone River not be considered as a potential management alternative."

With this recommendation, the Task Force went on record as stating that the construction of a flood control dam and impoundment on the mainstem of the Yellowstone River not be considered as a potential management alternative. The Task Force also emphasized in their deliberations that this recommendation applies only to the mainstem of the Yellowstone and does not apply to side channels or irrigation diversions.

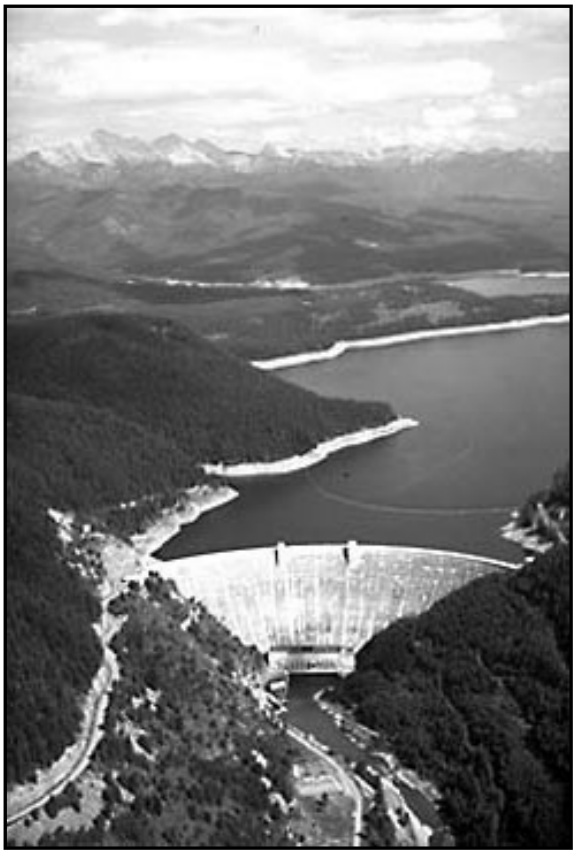


Photo 67. Hungry Horse Dam. Photo source unknown.

Photo 68. Como Dam. Photo source unknown.

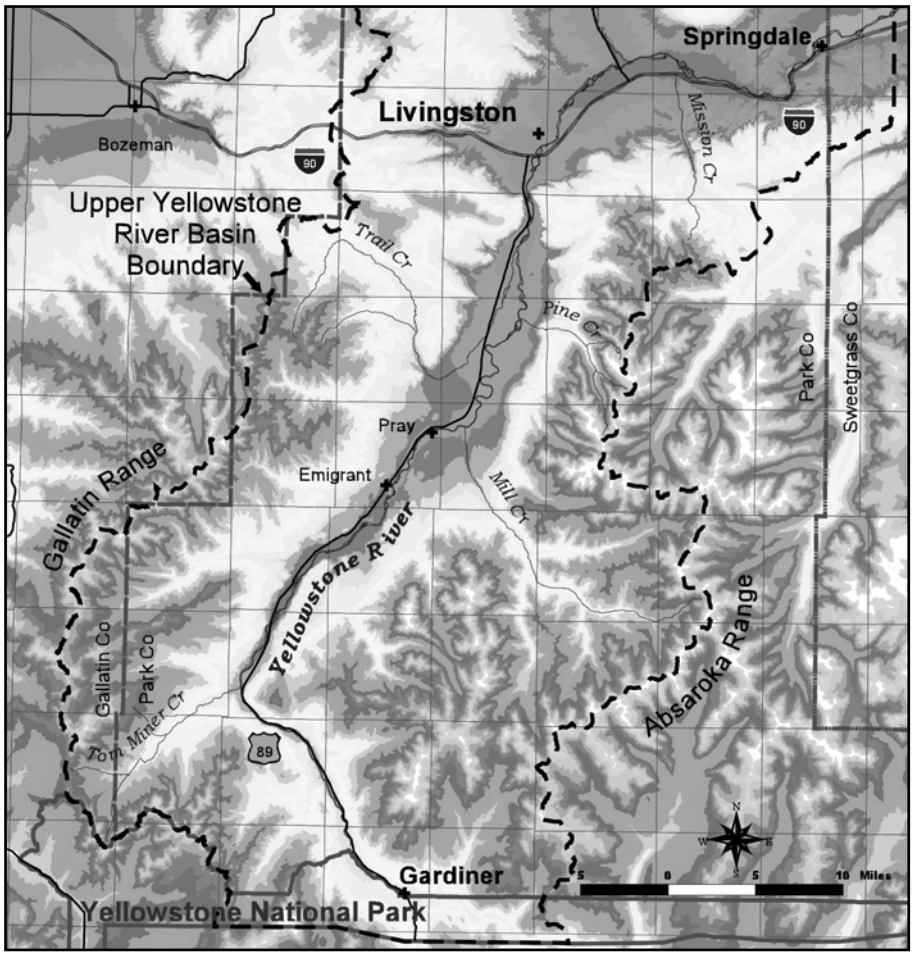
Recommendation XI.c. deliberations: This recommendation was originally proposed and reached consensus on August 12, 2003.

UPPER YELLOWSTONE RIVER STUDY AREA

The Upper Yellowstone River Study Area was defined for the Task Force in the Governor's Executive Order No. 19-97 as "that reach of river (including its tributaries), beginning at the Yellowstone Park boundary and extending downstream to the bridge crossing at Springdale," Montana. Flanked by the Crazy and Bridger Mountain Ranges to the north, the Absaroka Range to the east, the Gallatin Range to the west, and Yellowstone National Park to the south, approximately 85 miles of the Yellowstone River flows within this 2,930 square-mile basin (see *Map 3* below).

The Upper Yellowstone River Basin represents a significant and valuable natural and economic resource for local area residents, citizens of Montana, and our nation as a whole. This unique ecosystem houses the Yellowstone River (the longest free flowing river in the lower 48 states), Yellowstone National Park, the Absaroka-Beartooth Wilderness Area, large populations of diverse wildlife, and viable and varied fish populations. It is home to more than 15,000 Montana residents and is visited by more than one million tourists each year.

The upper Yellowstone River, and its continued health, is essential to the local and regional economy. Park County, which makes up 2,667 square miles of this watershed, is largely supported by industries that rely heavily on the continued long-term health and well being of the Yellowstone River. Ranchers and farmers depend on the river to provide the elements necessary to sustain successful agricultural operations. They, in turn, provide the open space, wildlife and fish habitat, and scenic views that are enjoyed by the many other residents and visitors to the area.



Map 3. Upper Yellowstone River Study Area.

Located in south central Montana, the upper Yellowstone River meanders through the heart of Park County. Park County is Montana's 12th most populous county. The city of Livingston is the county seat and the state's 11th largest city with approximately 8,500 residents. Most of Livingston's residents are directly affected by changes in the Yellowstone River, as it literally dissects the city from south to north. Channel modification has occurred with varying intensity throughout the study area. Relatively little channel modification has occurred between Gardiner and Mill Creek. A moderate amount of channel alteration has occurred between Mill Creek and Carters Bridge, and from Mission Creek to Springdale. The most intensive channel alteration has occurred between Pine Creek and Mission Creek, with the greatest activity in the urban Livingston area (Report 10).

UPPER YELLOWSTONE RIVER PROJECT

Science-Based Approach to Watershed Assessment

Over the past six years, the Task Force conducted an interdisciplinary study effort to assess the cumulative effects of bank stabilization, channel modification, and natural events on the physical, biological, and cultural attributes of the upper Yellowstone River. The scientific data produced in this effort helped the Task Force achieve an overall goal of developing a set of river corridor management recommendations. The Task Force-sponsored investigation has been a collaborative and comprehensive way to provide useful information that regulatory agencies, landowners, and the interested public may use to facilitate improved management of the river and flood plain.

As was directed by Governor Martz, the Task Force completed their third and final term in late August 2003. The project time line and associated research strategy called for collection and analysis of baseline biophysical and socio-economic information in the Upper Yellowstone River Study Area from 1999 through 2003. Each study required one to three years of baseline data collection and analysis. The timing of that fieldwork was driven by weather, flow conditions, and funding availability. All data collection was completed as of December 31, 2002. Informational presentations—presentations of research findings and analyses to the Task Force and public—were conducted from September 2002 through April 2003.

The final project phase was the development of management recommendations based on an integrated and enhanced understanding of the upper Yellowstone River and its biophysical and cultural components. This phase was conducted from May through August 2003. The Task Force met 12 times during that four-month period to develop, deliberate, and finalize their recommendations. Ultimately, 43 recommendations reached consensus and were adopted (see pages 11 to 54 of this report for details).

The Task Force formally presented their final recommendations to Governor Martz on October 20, 2003. Those recommendations are also being presented to other entities such as conservation districts, the Corps, EPA, DNRC, MDT, DEQ, and others. It is the Task Force's intent that such recommendations will guide the decision-making process in the upper Yellowstone for years to come. With defensible science as the foundation for their recommendations and constant input and review from the local community and regulatory agency partners, these recommendations are sure to have practical application in the Upper Yellowstone River Basin.

Upper Yellowstone River Cumulative Effects Investigation

Background

The Task Force was established in November 1997 and directed to bring together disparate community groups to discuss and develop a shared understanding of the issues and competing values and uses that impact the upper Yellowstone River. The Task Force originally envisioned a study that would focus mainly on the river channel; over time, however, other state and federal actions necessitated a broader project scope. The catalyst for that change centered around two past actions: (1) a Special Area Management Plan in 1998, and (2) a law suit over the cumulative impact portions of the 404 Corps permit decision documents on the Yellowstone River in 2000.

The river corridor study conducted by the Task Force reflects a collaborative effort to address regulatory requirements where possible. A corridor and floodplain approach was maintained as the primary geographic study area for the project. However, given that cumulative impact analysis required a broader watershed-level project area, watershed-scale data were included in the overall study design and data products generated.

Special Area Management Plan (SAMP)

The Corps' involvement on the project began in 1997 with their participation as an Ex-Officio member of the Task Force. Their role then expanded in 1998 with a Congressional authorization for the Corps to assess the effects of bank stabilization on the upper Yellowstone River by developing a SAMP. Although somewhat rare, a Corps institutional response to the increase in permit activity is to initiate the development of a SAMP. In the case of the upper Yellowstone that increase in permits was a direct result to the 1996 and 1997 flood events.

> 1999 Energy and Water Development Appropriations
> Senate Report #105-206
>
> The [Senate] Committee recommendation includes $320,000 for the Corps to initiate and complete the Yellowstone River special area management plan, Gardiner to Springdale, Montana, study which will assess the long-term effects of streambank stabilization. Information provided by the study should help in making timely decisions based on a watershed approach, and possibly result in a general permit for the area. The Committee expects that this effort will be coordinated with the Yellowstone river task force.

A SAMP is a regulatory planning tool and process that allows the Corps to assess all permitting issues in a river corridor or watershed context, as opposed to evaluating permits individually on a case-by-case basis. Specific language within the appropriations bill (see adjoining text box) states that as part of the SAMP, the Corps would assess the long-term effects of bank stabilization, fully coordinate with the Task Force, apply a watershed-level approach to the decision-making process, and potentially conclude the process with a general permit.

General permits cover activities that the Corps has identified as being substantially similar in nature and causing only minimal individual and cumulative environmental impacts. According to the Corps, an ideal SAMP would conclude with two products:

(1) appropriate local/state approvals and a Corps general permit or abbreviated processing procedure for activities in specifically defined situations; and (2) a local/state restriction and/or an Environmental Protection Agency 404 (c) restriction, preferably both, for undesired activities.

An individual permit review may be conducted for activities that do not fall into either category above. However, it should represent a small number of the total cases addressed by the SAMP.

With the adoption of the final Task Force recommendations in August 2003, direct cooperation between the Corps and the Task Force came to an end.

Montana Council of Trout Unlimited et al (plaintiffs) v. US Army Corps of Engineers (defendant)

The second action concerning the Corps was a 404-Permit lawsuit on the Yellowstone River. The United States District Court (Billings Division) in a May 2000 decision granted the plaintiffs motion for summary judgment and directed the Corps to re-open the 14 permits challenged (seven of those permits within the upper Yellowstone River study area). The court directed the Corps to reevaluate the cumulative impact portions of permit decision documents and determine whether or not an environmental impact statement needed to be completed for each project. The Corps has been reevaluating the permits to comply with the court order.

This court decision clearly illustrated the need for better baseline river data and the difficultly of addressing cumulative impact analysis on the Yellowstone. The culmination of the Task Force and SAMP efforts is satisfying both state and national needs.

Addressing TMDL

Like many other river systems throughout Montana, the Montana DEQ has scheduled TMDL development for the Upper Yellowstone River and several of its tributaries in 2007. The Task Force has worked closely with the DEQ during all six years of the project to ensure that data collected by Task Force researchers would also provide the baseline data needed for TMDL plan development.

Project Overview

The Upper Yellowstone River Cumulative Effects Investigation was undertaken as the pilot project for the Yellowstone River. It has not been an investigation designed to help solve just one management or pollution problem; rather, it has provided information and recommendations upon which many management decisions will be based. Baseline data on the seven major components of this river system (described in detail on the following pages) will provide information to a wide array of river users and managers for years to come. This investigation has become a “bench mark” study and protocol for down river efforts and hopefully for many other western river studies.

Integrated Project Design

The overall goal of the Task Force was to develop a set of river corridor management recommendations that address potential adverse cumulative effects of river channel modification, floodplain development, and natural events on the human community and

riparian ecosystem. Development of management recommendations involved identification and evaluation of the river's natural and economic resources, in these phases:

1. Data collection, analysis, and mapping.
2. Education and presentation of research findings.
3. Data sharing and synthesis.
4. Development and adoption of management recommendations.

In 1998, the Task Force TAC developed an interdisciplinary study design (*Figure 1*) to assess the cumulative effects of bank stabilization, natural, and other channel modification on the physical, biological, and cultural attributes of the upper Yellowstone River. The investigation consisted of seven interrelated research components:

1. Watershed Conditions and Land Use
2. Geomorphology
3. Hydrology and Hydraulics
4. Riparian Vegetation
5. Fish Habitat & Populations
6. Wildlife Habitat & Populations
7. Socio-Economic

These seven biophysical and social components—described in detail in the next section of this report—form a cascade in which the attributes of each successive (or parallel) component are affected by processes and interactions within or between previous components. Their hierarchical relationship is also illustrated in the integrated project design, *Figure 1*.

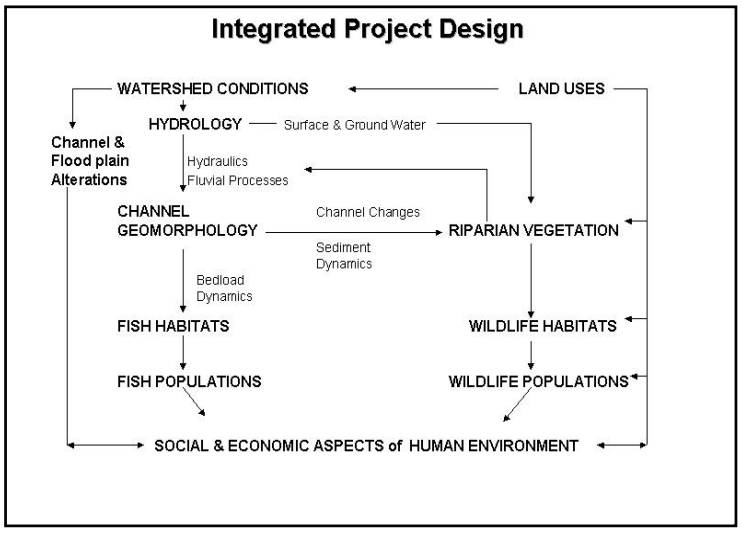


Figure 1. Integrated Project Design for the Upper Yellowstone River Cumulative Effects Investigation. This conceptual model shows the links amongst the seven interrelated study components.

Guiding principles that stayed consistent through all the above-mentioned phases are:

1. Science Led Effort
   Provide complete and comprehensive scientific data, which will allow for better understanding of the issues, resources, and uses that affect the integrity of the Upper Yellowstone River Watershed.
2. Investigate Issues Specific to Upper Yellowstone River Corridor and Watershed
   Help explain how and why key elements of the watershed and river corridor (natural and human-induced) have changed over time.
3. Develop Recommendations that have Practical Application
   Provide the Task Force and regulatory agencies with the information and analytical techniques necessary to evaluate river channel and floodplain problems, and proposed solutions.

RESEARCH SUMMARY

Research Components of the Upper Yellowstone River Investigation:

I. WATERSHED CONDITIONS AND LAND USE

1. **Yellowstone River Physical Features Inventory**
2. **Aerial Photography**
3. **Contour/Topographic Floodplain Mapping**
4. **National Wetland Inventory—Riparian/Wetlands/Land Use Mapping**
5. **Current Watershed Land Use Assessment**
6. **Historic Watershed Land Use Assessment**

II. GEOMORPHIC ANALYSIS

III. HYDROLOGY AND HYDRAULIC ANALYSIS

IV. RIPARIAN TREND ANALYSIS

V. FISHERIES ANALYSES

1. **Fish Populations Study**
2. **Fish Habitat Study**

VI. WILDLIFE (BIRD) ASSESSMENT

VII. SOCIO-ECONOMIC ASSESSMENT

I. WATERSHED CONDITIONS AND LAND USE

1. Yellowstone River Physical Features Inventory

Title: Yellowstone River Physical Features Inventory–Gardiner to Springdale

Principal Investigator: Thomas Pick (Water Quality Specialist), NRCS, Bozeman, Montana.

Goal: Compare the degree of change in specific physical features within the upper Yellowstone River corridor from past (1987) to current (1998) conditions. The physical features inventory was conducted as a first step in understanding cause and effect relationships in the Upper Yellowstone River Study Area. The results of this inventory have served as a prioritization tool to guide further data acquisition and analysis efforts by the Task Force.

Completion Date/Product: 1998. Report 1. *Yellowstone River Physical Features Inventory–Gardiner to Springdale.*

Access to Data: The physical features inventory may be viewed by visiting the Natural Resources Information System web site: nris.state.mt.us/Yellowstone, and the Task Force website at: www.upperyellowstonerivertaskforce.org.

2. Aerial Photography

On April 11, 1999, low-flow (1,500 cubic feet per second) aerial photos of the upper Yellowstone River corridor were flown for the Task Force. The river corridor was flown at three scales: 1:6000, 1:8000, and 1:24000. Stretches of the river with greater channel complexity and/or more development in the flood plain were flown closer to the ground (1:6000- and 1:8000-scale), in order to show greater detail. Sixty-three aerial targets and control points were laid out prior to photo acquisition and survey-grade GPS control was established for the control network. These photos are the basis for two mapping projects: orthophoto quad maps and contour/topographic maps, which are described in detail in the *Topographic Mapping* and *Hydrology and Hydraulic Analyses* sections of this report.

Principal Investigators: Chuck Dalby and Jim Robinson, Water Management Bureau, Montana DNRC, Helena, Montana; Don Patterson (PLS), Team Leader, Geospatial Data, US Forest Service, Region 1, Missoula, Montana.

Goal: Acquire targeted, ground-controlled aerial photos for topographic orthographic mapping of the contemporary upper Yellowstone River channel and flood plain.

Completion Date/Products: Spring 1999. 1:6000 (color), 1:8000 (black and white), and 1:24000 (black and white) aerial photos; survey-grade ground control for 63 aerial targets.

Access to Data: Copies of aerial photos can be purchased through the Task Force/Park Conservation District office in Livingston.

3. National Wetlands Inventory—Riparian/Wetlands/Land Use Mapping

Title: Riparian, Wetlands, and Land Use Mapping for the Yellowstone River Corridor: Gardiner to Springdale, Montana

Principal Investigator: Chuck Elliott (Regional Coordinator), US Fish and Wildlife Service, National Wetlands Inventory, Denver, Colorado.

Goal: Document land use and land cover within the Upper Yellowstone River Study Area corridor.

Completion Date/Product: July 2001. 1:24000-scale riparian, wetlands, land cover data themes. Report 2. *Upper Yellowstone River Mapping Project* (National Wetland Inventory).

Access to Data: Data are available for downloading via the National Wetlands Inventory Center in St. Petersburg, Florida at: www.nwi.fws.gov, and on the Task Force website at: www.upperyellowstonerivertaskforce.org.

4. Topographic Mapping of the Flood Plain

Note: Also see *Hydrology and Hydraulic Analyses* section of this report for floodplain mapping details.

Title: Topographic Mapping of the Upper Yellowstone River Channel and Flood Plain from Gardiner to Springdale, Montana

Principal Investigator: US Army Corps of Engineers, Omaha Nebraska.

Goal: Prepare digital orthophotos and topographic maps suitable for floodplain and other resource delineation.

Completion Date/Products: February 2003. The Corps cooperated with the USGS-WRD on this floodplain mapping project. The Corps produced two preliminary topographic maps and similar scale orthophotos for the river segments in the Livingston urban reach [1:6000-scale (two-foot contours) and 1:8000-scale (four-foot contours)]. The USGS-WRD produced seven preliminary maps from Carters Bridge to Point of Rocks.

Access to Data: Preliminary floodplain maps may be downloaded by visiting the DNRC website at: www.dnrc.state.mt.us, by contacting the Park County GIS Office, or by contacting the Task Force/Park Conservation District office. The DNRC and Park County are pursuing formal adoption of final floodplain maps at the present time.

5. Current Watershed Land Use Assessment

Title: Upper Yellowstone River Watershed Land Cover Assessment

Principal Investigators: Thomas Pick (Water Quality Specialist), NRCS, Bozeman, Montana; Dr. Richard Aspinall (Director), Geographic Information and Analysis Center, Montana State University, Bozeman, Montana.

Goal: Depict the extent and spatial relationships of present land cover/use in the Upper Yellowstone River Study Area.

Abstract: The watershed land use research team used three basic indicators of watershed integrity: hydrologic function, water quality, and upland wildlife habitat to evaluate potential land cover changes within the upper Yellowstone River watershed. A satellite-based land cover classification was completed for 2,474,141 acres within the Yellowstone River basin (10070001-Yellowstone Headwaters and 10070002-Upper Yellowstone 4th code subbasins) using Landsat satellite imagery dated July 13, 1999, and July 12, 1985. Differences in spectral attributes between 1999 Enhanced Thematic Mapper (ETM+) and 1985 Thematic Mapper (TM) scenes, in addition to excessive cloud cover on the 1985 scenes, prevented accurate comparison of land cover change over time. The land cover assessment was performed solely on the 1999 classification. Post-stratification accuracy was 72.2 percent. A Geographic Information System (GIS) analyzed the distribution and intersection of key resource theme attributes (soil, climate, ownership, topography, census, and important wildlife habitat) with the 1999 land cover classification. Results indicated that the very diverse landscape was largely composed of federally managed, coniferous forest, and shrub/grasslands. Urban or Developed and Agricultural Land/Irrigated land cover together accounted for less than two percent of the watershed area. Broadleaf Riparian represented the next to least in extent of the 15 cover classifications identified. Differences in land cover characteristics were measured between 5th code hydrologic units (HUCs). Low/Moderate Cover Grasslands, Agricultural Lands/Irrigated, Urban or Developed, and Broadleaf Riparian cover categories increased in relative composition in a downstream direction and in proximity to the river corridor. Low/Moderate Cover Grasslands surprisingly were the most prevalent land cover category within the half-mile-wide corridor bisected by the river. Evaluations of land cover related to hydrologic function, water quality characteristics, and upland wildlife habitat were also presented and discussed. Although land cover composition at the watershed scale appears to be relatively uninfluenced by human activity at present, the research team recommended periodic reassessment of land cover at the watershed and stream corridor scales in conjunction with monitoring common biotic indicators to track and evaluate the effect of land cover trends over time on stream and watershed function.

Completion Date/Products: August 2003. Report 7. *Upper Yellowstone River Watershed Land Cover Assessment.*

Access to Data: The watershed land cover final report may be viewed by visiting the Task Force website at: www.upperyellowstonerivertaskforce.org.

6. Historic Watershed Land Use Assessment

Title: Historic Watershed Land Use Assessment

Principal Investigators: Monica Brelsford, Dr. Bruce Maxwell, Dr. Andrew Hansen, Montana State University, Bozeman, Montana.

Goal: Map change in land cover and land use in sample portions of private and public lands in the Upper Yellowstone River Basin for the dates: 1948/49, 1979, 1998.

Introduction: The Task Force was interested in land use changes over time as a gauge of cumulative effects for the Upper Yellowstone River Basin. This project is a follow up to the work of Harrison and Potter (2001) that used satellite imagery to assess land cover change. Due to quality of imagery from the 1970s relative to imagery from the 1990s, they were unable to map the watershed at a level of detail required to assess land use change that occurred along the upper Yellowstone River. The goal of this study was to map portions of the Upper Yellowstone River Basin, focusing on private and public lands adjacent to the river, as well as map into the foothills for the years 1948, 1979, and 1998.

Objectives:

1. Map land use/cover for three years, 1948/49, 1979, and 1998, in four sample areas along the upper Yellowstone River with a focus on agricultural and rural residential land uses.
2. Characterize historical land use change by identifying areas where change has occurred, the types of change that have occurred, and their relationship to the Yellowstone River.
3. Map house locations for three years, 1948/49, 1979, and 1998, in four sample areas along the upper Yellowstone River.
4. Characterize home location in relation to land use/cover and the Yellowstone River.

Summary:

There has not been significant or consistent shifts in land use/cover for the four study areas in the Upper Yellowstone River Basin between the years 1948 and 1998. Land use classifications were grouped into agriculture, grassland, shrub lands and riparian. Of the land classified as agriculture in 1948, 80 percent of that land remained in agriculture in 1998. For riparian lands, 87 percent of the area remained as riparian. For the grasslands classification, 89 percent of the grasslands still remained in grasslands by 1998. Eighty-two percent of the shrub lands remained as shrub lands in 1998. Agricultural lands increased by 2,406 acres, riparian lands decreased by 868 acres, grasslands decreased by 3,745 acres, and shrub lands increased by 146 acres. Other classifications not in the grouped data changed as follows: commercial lands increased by 445 acres (airport), forest increased by 1,477 acres, and disturbed land increased by 80 acres.

The number of homes have increased by 555 percent in the last 50 years. The total number of homes increased 99 percent between the years 1948 and 1979. For the

years 1979 to 1998, the number of homes increased 229 percent. The Emigrant area demonstrated the largest percent increase in homes, while the Pine Creek study area had the lowest percent increase in homes. Using the study maps created by the US Army Corps of Engineers and USGS-WRD in 2003 and riparian zone study map created by Mike Merigliano, 17 homes were found to be located within the 100-year flood plain and an additional 121 homes were located within 100 meters of the 100-year flood plain.

In this study, home sites were not mapped as a land use classification and they did not have acreage. However, with the dramatic increase in homes along the Yellowstone River, it is important to place homes on the map and relate their presence to the landscape. Therefore for this study, an impact zone with a 100-meter radius or approximately 7.76 acres was created around a home and used to evaluate land use change due to residential housing. In all four study areas, there was a reduction in agricultural, grassland, and riparian land use types due to the home site impact zone. Residential impact zone covered 4.6 percent of the landscape when all four sites are combined.

Completion Date/Products: June 2003. A written summary of findings: Report 6. *Historic Watershed Land Use Assessment of the Upper Yellowstone River Valley*, and digital format of useful data layers created in ArcView.

Access to data: The historic watershed land use final report may be viewed by visiting the Task Force website at: www.upperyellowstonerivertaskforce.org.

II. GEOMORPHIC ANALYSIS

Title: Historical Channel Changes and Geomorphology of the Upper Yellowstone River

Principal Investigators: Chuck Dalby (Hydrologist) and Jim Robinson (Geologist) Water Management Bureau, Montana DNRC, Helena, Montana.

Goal: Develop a quantitative framework for evaluating historic river channel changes and the physical effect that historic channel modification (for example, bank stabilization measures) may have had on the river and flood plain; also provide a partial basis for estimating the potential cumulative effect of contemporary river management alternatives.

Summary:

In response to lateral erosion and flooding, caused by 100-year floods in 1974, 1996, and 1997, extensive segments of the upper Yellowstone River have been modified using dikes, levees, riprap, and jetties (barbs). Confinement of river channels by roads, bridges, levees, barbs, and riprap often leads to reduced lateral migration rates, incision of channels, coarsening of the bed, and loss of hydraulic connectivity with side channels. This investigation (a) mapped the contemporary (1999) fluvial geomorphology of the upper Yellowstone River (85 mile reach from Gardiner to Springdale, Montana) and historic channel changes (1948-1999); (b) developed a process-based geomorphic

channel classification (stability and morphology) of the 1999 channel; (c) mapped contemporary and historic (1954, 1973, 1999) channel modifications and revetments; and (d) measured and analyzed retrospective geomorphic effects of channel modifications on channel geometry and hydraulic characteristics (in progress).

Contemporary data were collected on: low-water and bankfull—channel hydraulics (width, depth, slope), channel pattern, and gravel-bar and island characteristics; and low-water— surface and subsurface particle-size distribution, woody-debris abundance, and natural and human channel confinement. These data were used, in conjunction with information on 1948-1999 channel changes, to develop a modified version of the Montgomery-Buffington channel classification applicable to the upper Yellowstone River. Channel classification provides an objective framework for sampling geomorphic strata, assessing channel stability and channel changes, and for a variety of channel management actions (for example permitting, monitoring design).

The classification recognizes seven distinct channel types and the spatial distribution is largely controlled by Paradise Valley, Pinedale glacial history. Very stable*,* entrenched*, bedrock, cascade*, and *plane-bed* channels occur mainly between Gardiner and Mill Creek and have changed little since 1948 (49 percent of channel length). *Pool-riffle* and *anabranching* (multiple-thread) channels occur throughout the downstream drainage (40 percent of length), are more dynamic, and locally show significant change in response to the 1974 and 1996/97 floods. *Anabranching/braided* channels are located in several segments between Pine Creek and Mission Creek (11 percent of channel length) and are the most dynamic with the largest rates of lateral migration and occurrences of rapid lateral change (avulsion). Of the total channel length between Gardiner and Springdale, about 14 percent (12 miles) was classified as strongly affected by channel modification (riprap, levees, etc); another six percent (4.9 miles) was affected by combined natural and human constraints. The most common *Forced* morphology is where anabranching channels are constrained to pool-riffle or plane-bed channels (for example, the main channel near the head of Armstrong and Nelson's Spring Creeks, and the Livingston area). Linear channel and floodplain modifications (for example dikes, levees, road prisms) have increased 265 percent (from 34,700 to 92,250 feet) between 1954 and 1999, while riprap increased 400 percent (from 27,400 to 111,260 feet) and point structures (that is, jetties and barbs) increased 600 percent (from 47 to 292 feet). About 50 percent of the riprap and 80 percent of the point structures are located along pool-riffle, anabranching, and anabranching-braided channel types that comprise 50 percent of the study area.

Comparison of 1948-49 and 1999 main-channel, low water, centerline length (Gardiner to Springdale), shows that channel length has remained essentially constant, although lateral channel position has changed remarkably in some areas (especially anabranching/braided channels)—an indication of maintenance of a relatively stable channel slope. The largest change was a two-percent reduction in length of the channel segment extending from Carbella to Eightmile Creek. A similar comparison of the change in length and type of side channels, found between Gardiner and Springdale, shows that the total length has increased by about 16 percent between 1948-49 and 1999.

Large floods (~100-year or greater recurrence interval events) have occurred in 1894, 1918, 1974, 1996, and 1997 in the Upper Yellowstone Basin. The standard model of channel response to large floods indicates that other factors being equal, large floods may be more likely to cause lasting channel changes in narrow steep valleys, than in broad, low-gradient valleys. The upper Yellowstone River deviates from this model of channel response, with most flood-related channel changes occurring in multiple-thread and pool-riffle channel types that are relatively unconfined and of lower gradient, compared with plane-bed and cascade channel types dominant in the upper basin (Gardiner to Mill Creek) where the channel is the most entrenched and confined by fluvio-glacial terraces. A likely explanation for this deviation is that in spite of the lateral confinement and increased flood power, the resisting forces (for example very coarse bed material) in the channel bed and banks remain dominant. Channel changes in the 1974 and 1996-1997 floods occurred primarily through lateral erosion in pool-riffle channel segments and through avulsion and lateral erosion in anabranching channel segments. It appears that a channel response model for these segments of the upper Yellowstone includes relatively rapid lateral changes through avulsion in large events (for example 50- to 100-year floods), which establish the dominant lateral channel configuration. Between these events, more frequent flows with return periods close to the conventional "bankfull" discharge (for example two- to five-year floods) shape and maintain the average characteristics of the individual anabranches.

Within the 12 miles (20 kilometers) of channel affected primarily by man, local channel response includes channel incision (Livingston area), aggradation, and modification of channel alignment. In spite of these modifications, the channel is remarkably resilient due largely to the coarse bed and bank material and the fact that channel confinement in most reaches is generally limited to one bank and has not always effectively constrained the channel in large events. Retrospective analysis of 1948 to 1999 spatial distribution and type of side channels shows a net increase in side-channel length and maintenance of river/floodplain connectivity in all but the Livingston urban area that is frequently riprapped and/or leveed on both banks. In general, the overall stability and physical characteristics of about 80 percent of the study area remain similar to those of the Yellowstone River in 1948.

Geomorphic information is being used in conjunction with information from USGS-WRD models (one-dimensional, step-backwater hydraulic model and sediment transport model) and USGS-BRD's two-dimensional hydraulic, fish-habitat model, to examine potential cumulative effects of different channel modification and bank-stabilization scenarios on channel physical channel characteristics and stability. This work is being done in support of the US Army Corps of Engineers, Special Area Management Plan development.

Completion Date/Products: October 2003. Report 10. DRAFT *Historic Channel Changes and Geomorphology of the Upper Yellowstone River, Gardiner to Springdale, Montana*. The final product (including cumulative effects analysis products) is projected to be completed in early 2004.

Access to Data: The geomorphology draft final report may be viewed by visiting the Task Force website at: www.upperyellowstonerivertaskforce.org.

Need for Further Study: Monitoring of physical channel changes associated with channel modifications and revetments should be an ongoing effort with data collection protocols developed for channel segments based on contemporary channel stability (for example aggrading, degrading, relative stable) and geomorphic channel type. Frequency of measurement should be tied to recurrence interval of annual peak flow. All events with recurrence intervals greater than five years should trigger some level of coordinated monitoring.

Using the detailed channel profile (compiled by DNRC from their field survey and USGS-WRD and BRD surveys) as a baseline, the elevations of all key channel controls (including the elevations of the inlet and outlet channels of key side channels) should be measured with the above frequency.

Three-dimensional channel topography data should be collected for priority channel segments (for example those that show incising trends) between Mallards Rest and Livingston. These measurements provide direct useful information on channel response and potential problems (for example scour near Nelsons Spring Creek), provide a basis for developing three-dimensional sediment budgets for selected channel segments, and hydraulic information for fish habitat evaluation. Developing three-dimensional morphology based sediment budgets of priority channel segments is probably the most important geomorphic study need.

Black-and-white aerial photography (1:6000-scale) should be acquired for key channel segments after floods with recurrence intervals greater than five to ten years. Photos should be controlled (aerial targets) and flown under leaf-off, low flow conditions in the spring (other resource areas may require photos flown under leaf-on maximum canopy conditions). Alternatively, LIDAR and uncontrolled stereo aerial photos could be acquired.

III. HYDROLOGY AND HYDRAULIC ANALYSIS

Title: Analysis of Hydraulic Characteristics, Floodplain Delineation, and Sediment-Transport Investigations for the Upper Yellowstone River from near Gardiner to Mission Creek in Park County, Montana

Principal Investigators: Steve Holnbeck (Hydraulic Engineer) and Chuck Parrett (Supervisory Hydrologist), US Geological Survey, Water Resources Division, Montana District Office, Helena, Montana.

Goal: Analyze the potential effects of seasonal runoff, and river management and bank stabilization alternatives on sediment load, channel geometry, streambed profiles, and water surface elevations. Collect selected hydraulic and sediment data to support the modeling effort. Develop a floodplain delineation map.

Objectives:

1. Obtain channel geometry data at approximately 140 cross sections for the reach from Point of Rocks to the mouth of Mission Creek.
2. Delineate 100-year flood limits from Gardiner to Springdale. For the reach from Point of Rocks to Mission Creek, delineate the 100-year flood plain and floodway, and 500-year flood plain.
3. Sample bedload and suspended-sediment gradation and concentration, and perform other related data-collection efforts to characterize the sediment being transported in the Upper Yellowstone River Basin and to support modeling efforts.
4. Perform hydraulic and sediment-transport modeling to estimate relative changes in channel geometry, streambed profiles, and water surface elevations resulting from different sediment loads and water discharges.

Report 11. *DRAFT Flood Profile Data and Flood and Floodway Boundaries for the Upper Yellowstone River, Montana*.

Introduction:

The US Geological Survey (USGS), in cooperation with Park Conservation District, Montana Departments of Transportation and Natural Resources and Conservation, and the US Army of Corps of Engineers, investigated the hydraulic characteristics of the upper Yellowstone River as part of the cumulative effects study. The USGS investigation included (1) surveying channel and bridge geometry data on the Yellowstone River, (2) conducting a flood-profile analysis, (3) flood-boundary delineation for selected flood discharges and floodway delineation, and (4) sediment data collection and sediment-transport modeling for a portion of the upper Yellowstone River. The purpose of this report is to summarize the flood-profile analysis and the flood boundary and floodway delineation.

Summary:

The USGS investigated the hydraulic characteristics of the upper Yellowstone River, Montana, as part of an overall cumulative effects study. The hydraulic investigation included surveys of channel and bridge geometry at 140 cross sections from Carter Bridge upstream to Gardiner, determination of flood elevations at the cross sections for selected T-year floods, and mapping of flood and floodway boundaries. Flood-frequency data were determined at two USGS gaged sites by application of the log Pearson Type 3 probability distribution. Flood-frequency data at ungaged sites below the mouths of major perennial tributary streams were determined by interpolating between the two gaged sites using drainage area as the basis for interpolation.

Two different levels of hydraulic analyses, based on use of the hydraulic model HEC-RAS, were used for the study reach. A more detailed hydraulic analysis was made for the study reach from Carter Bridge upstream to just above Point of Rocks Bridge. Within this reach, higher-resolution aerial photography and more detailed topographic data were available, and the analysis included calculation of flood profile data for the 2-, 10-, 50-, 100-, and 500-year floods and mapping of 100- and 500-year flood boundaries and determination of a hydraulic floodway. A less-detailed hydraulic analysis was performed for the study reach from Point of Rocks Bridge upstream to Gardiner. This reach had lower resolution aerial photography, much less detailed topography, and

greater spacing between surveyed cross sections than the more-detailed study reach. Flood profile data for just the 100-year flood were calculated in this study reach, and flood boundaries for just the 100-year flood were determined. No flood profile data of hydraulic analyses were performed for the Yankee Jim Canyon area because flood widths in this narrow canyon were confined to the channel.

Report 12. *DRAFT Sediment Transport Investigations in the Upper Yellowstone River, Montana, 1999 through 2001: Data Collection, Analysis, and Application of a Sediment-Transport Model.*

Abstract:
Sediment transport in the upper Yellowstone River near Livingston, Montana, was investigated by the US Geological Survey as part of an overall cumulative effects study aimed at providing a scientific basis for river management decisions.

As part of the sediment-transport investigations, the USGS surveyed 40 river cross sections along a 13.5-mile study reach of mainstem, collected bedload- and suspended-sediment data in the field over three snowmelt runoff seasons for discharges ranging from about 2,200 cubic feet per second to 25,100 cubic feet per second, and characterized bed-material size throughout the study reach using particle counts and sieve analyses. Sediment data were used to develop sediment-transport curves relating sediment mass transport to stream discharge and individual transport equations for seven size classes of sediment ranging from very fine sand to small cobbles. A step-wise regression procedure relating sediment mass transport to important hydraulic variables showed that average channel velocity was the only significant variable at the 95-percent confidence level.

Sediment data collected and analyzed, including bed-material sizes, transport curves, and sediment-transport equations were then used in a computer model to simulate sediment transport in the study reach. The BRIdge Stream Tube Model for Alluvial River Simulation, or BRI-STARS, was used to simulate a variety of hydraulic conditions and river management scenarios. The model was calibrated and verified using data from historic runoff periods and was determined to produce reasonable results based on observed channel-geometry changes for selected runoff periods at selected locations.

While model results generally agreed with observed channel-geometry conditions, the reach-averaged sediment-discharge hydrographs generated by the BRI-STARS model generally showed less overall sediment transport than did the sediment hydrographs derived from the sediment-transport curve and estimated flood hydrographs. The differences probably were largely due to the inability of the model to simulate channel-widening and mass-wasting processes, which had supplied sediment to the channel during the 1996 and 1997 floods. However, application of the sediment-transport curve to the range of discharges on the flood hydrograph may have resulted in some overestimation of sediment discharge.

Baseline conditions, considered to reflect the current channel geometry, sediment-transport reactions developed, and existing bridge configurations, were simulated using flood hydrographs derived from gaging-station data and flood-frequency relations for discharges having 2-, 50-, 100-, and 500-year recurrence intervals. Site-to-site

comparisons were then made that illustrated how sediment-transport capacity varied along the study reach for different sized floods. Box plots were used to statistically summarize the variation in main-channel degradation and aggradation over the 40-section study reach. Overall results generally indicated that aggradation was greater than degradation over the flood hydrographs examined. Box plots also were used to show the difference in water-surface elevation between simulations in fixed-bed mode and simulations in mobile-bed mode.

Once the baseline conditions were analyzed, various river management scenarios were analyzed using BRI-STARS and relative comparisons were made between scenarios. Scenarios evaluated at selected locations in the study reach included changes at two existing highway bridges, construction of a levee, and widening and narrowing of the main river channel. Cross section and profile plots at selected locations along the study reach were used to show changes in channel geometry and transport rates due to channel modification.

Completion Date / Products: November 2003. Report 11. *DRAFT Flood Profile data and Flood and Floodway Boundaries for the Upper Yellowstone River, Gardiner to Springdale, Montana*; map report showing the delineated flood plain. Report 12. *DRAFT Sediment Transport Investigations in the Upper Yellowstone River, Montana, 1999 through 2001: Data Collection, Analysis, and Application of a Sediment-Transport Model*; report describing the sediment-transport modeling for the stream reach from Carters Bridge to Pine Creek Bridge.

Access to Data: Final drafts of these reports are projected to be released in June 2004; at which point they may be viewed by visiting the Task Force website at: www.upperyellowstonerivertaskforce.org.

IV. RIPARIAN TREND ANALYSIS

Title: Temporal Patterns of Channel Migration, Fluvial Events, and Associated Vegetation Along the Yellowstone River, Montana

Principal Investigators: Dr. Michael Merigliano (Riparian Ecologist), and Mary Louise Polzin, College of Forestry and Conservation, University of Montana, Missoula, Montana.

Goal: Determine relationship between fluvial geomorphic processes and floodplain vegetation.

Abstract: Floodplain dynamics and vegetation along the upper Yellowstone River flood plain varied by geomorphic setting, which varied from broad, unconfined braided channel systems to single-thread channels with narrow flood plains confined by glacial terraces and bedrock. Although the general appearance of the vegetation and river system is similar to that of 100 years ago, retrospective age distributions and real-time trend analysis reveal a reduction in fluvial activity, cottonwood recruitment on an areal basis, and cottonwood forest area. The floodplain turnover period for the braided reaches is between 550 and 1,700 years. Dated floodplain area was positively

correlated with flood size, and cottonwood area decay curves indicate that most floodplain erosion and deposition occurs during large floods. Agriculture has caused a net reduction in forest area in the last 50 years, but loss to natural succession was about twice the loss due to agricultural conversion. Diversity of vegetation types was higher in naturally-unconfined, braided channel reaches compared to naturally-confined, single-thread channel reaches. Patch sizes were larger, and hydric and mesic plants were more common in the unconfined reaches.

Completion Date/Products: October 2003. Report 4. *Temporal Patterns of Channel Migration, Fluvial Events, and Associated Vegetation Along the Yellowstone River, Montana.*

1. Maps showing existing vegetation and cottonwood patch age classes.
2. Age distribution of cottonwood forest.
3. Floodplain turnover rates (based on a decay curve of floodplain age by area derived from #2 for lower reaches below Emigrant). The upper reaches may not have an extensive true flood plain and the turnover concept will be modified accordingly.
4. The relation between flow events and cottonwood establishment, and the influence of ice drives.
5. Data (field maps and notes) on existing vegetation community types, and wildlife habitat variables (to be determined).
6. Assessment of cumulative effects of bank stabilization projects incorporating the results of hydraulic modeling and floodplain dynamics. The frame of reference will be the channel migration rate and associated cottonwood forest age distribution under conditions as close to natural as possible.

Access to Data: The report may be viewed by visiting the Task Force website at: www.upperyellowstonerivertaskforce.org.

Need for Further Study: The mixed-age nature of the cottonwood patches are not unique to the Yellowstone River but their occurrence in different geomorphic settings and patch ages provides for an interesting study that could give insight into whether forests can be sustained in the absence of significant channel migration. While conducting the original study, DNA primers for cottonwood were developed to allow a genetic-based method to identify ramets (sprouts, asexual reproduction) and genets (seed origin stems, sexual reproduction). About 500 samples were collected from a subset of the fixed plots, and DNA extraction from young sprouted leaves is ongoing at the University of Montana. Test samples of extracted DNA have been sent to Oak Ridge National Laboratory, and DNA levels are within acceptable limits for microsatellite DNA analysis, which is the best method for identifying clones (Gerber and others, 2000; Schoot and others, 2000). The analysis at Oak Ridge will provide parentage and clone identification. This will enable correlation of clonal recruitment to river stage, elevation, substrate type, precipitation levels, and river scour. This in turn will help narrow down some of the factors influencing clonal recruitment along the Yellowstone River in narrowleaf cottonwood, but also the amount of clonal recruitment will be known. In essence, the study will address how common clonal recruitment is, ramet life span, and what are some important environmental factors. Many cottonwood systems have stabilized channels or flows due to damming, diversions, and bank revetments, and

sexual reproduction is limited (Rood and Mahoney, 1990). Perhaps vegetative reproduction can mitigate these impacts.

Vegetation structure is an important avian habitat component, and this study provided data for the wildlife component. The natural potential for understory, late-successional shrubs along the upper Yellowstone River flood plain is unknown. Much of the cottonwood forest had an understory dominated by grasses or grasses and xeric shrubs including Rocky Mountain juniper, silver buffaloberry, snowberry, and skunkbush (*Rhus trilobata*). Hansen and others (1995) suggest that such types would be dominated by red-osier dogwood (*Cornus stolonifera*) with less grazing pressure. Red-osier dogwood is palatable to wild ungulates and cattle and is sensitive to grazing. It was rare in the study area, and only a few stands larger than 0.25 hectares (0.5 acres) were found. Cattle grazing levels observed during our study were low in most places, and one area that had not been grazed since the 1930s did not have significant amounts of dogwood. Another study (Merigliano, in review) found a strong correlation between dogwood and water availability, which was in turn related to soil texture. The upper Yellowstone River soils are typically medium to coarse sands and may be too dry in late summer to support dogwood. A study relating water availability and understory species composition on sites of known, low grazing use could determine the natural potential of sites.

Our cottonwood aging sample was limited to land we had owner permission to access. The reach from the Highway 89 South Bridge to near Mission Creek was under-sampled. This area has a broader flood plain than much of the other sampled areas, and our decay curve estimates may not represent this very well. One way to assess this is to use the size distribution and total area of new gravel bars created during large floods as an index of channel migration rates and floodplain turnover. This index may be an efficient and effective way to obtain floodplain turnover. The geomorphology study (Dalby and Robinson, 2003) may have the island measurements, and our study has them for our sampled reaches only.

The impact of beaver on cottonwood stand structure is not understood for the upper Yellowstone River, or for large braided, northern Rocky Mountain rivers in general. A study that relates beaver densities, forage preference, and resulting stand structure would lend insight to their present impact, as well as allowing prediction of the effects of beaver trapping.

V. FISHERIES ANALYSES

1. FISH POPULATIONS STUDY

Title: Comparative Use of Modified and Natural Habitats of the Upper Yellowstone River by Juvenile Salmonids

Principal Investigators: Dr. Alexander V. Zale (Assistant Unit Leader) and Douglas L. Rider (Graduate Research Assistant), Montana Cooperative Fisheries Research Unit, US Geological Survey, Montana State University, Department of Biology, Bozeman, Montana.

Goal: Estimate to what extent bank stabilization, flow deflection, and flow confinement structures have changed aquatic habitat use by juvenile salmonids in the Yellowstone River.

Abstract: We compared juvenile salmonid use of stabilized main-channel banks (riprap, barbs, jetties) of the upper Yellowstone River to their use of natural, unaltered habitats by electrofishing in spring, summer, and fall, 2001 and 2002. Use of barbs and jetties was similar to that of natural outside bends, and use of riprap sections was higher than that of outside bends. Artificially-placed boulders and shoreline irregularities associated with the stabilized banks likely attracted juvenile salmonids. Bank stabilization did not *directly* decrease quality or quantity of juvenile salmonid habitat along the main channel of the upper Yellowstone River; indirect, geomorphically derived effects of bank stabilization on fish habitat were not examined. We also estimated abundances of juvenile salmonids in ephemeral lateral side channels during high discharge associated with spring runoff to determine if and to what extent juvenile salmonids used side channels. The average 50-meter side-channel sample unit (250.8 m^2) contained about 6.3 juvenile trout (all species) and 15.2 juvenile salmonids (trout plus mountain whitefish). Because of low-water conditions during both years of the study, the side channels were inundated for only about three to 10 days in 2001 and one to three weeks in 2002. The rapidity with which these habitats were colonized during the brief periods they were available suggests that juvenile fish positively selected for these habitats. Habitat modifications that reduce the frequency and duration of inundation of side channels, or reduce side-channel formation rates, or directly preclude inundation or accessibility of side channels would likely decrease juvenile fish habitat and possibly recruitment.

Completion Date/Products: March 2003. Report 4. *Comparative Use of Modified and Natural Habitats of the Upper Yellowstone River by Juvenile Salmonids* is in standard scientific format describing the findings and relevance of the study.

Access to Data: The *Comparative Use of Modified and Natural Habitats of the Upper Yellowstone River by Juvenile Salmonids* report may be viewed by visiting the Task Force website at: www.upperyellowstonerivertaskforce.org.

Need for Further Study:
Several additional investigations would provide a more comprehensive understanding of the effects of bank stabilization on aquatic biota of the upper Yellowstone River. First, additional sampling during years with higher discharges, both along main-channel banks and in side channels, would allow inference about the applicability of our findings under more normal conditions. Second, assessment of the effects of bank stabilization on non-game fishes, macroinvertebrates, and adult and sub-adult salmonids would provide a more holistic assessment of this issue. Third, a comprehensive assessment of recruitment dynamics of salmonids in the upper Yellow stone River system would provide managers with an understanding of which habitats (for example, tributaries, spring creeks, backwaters, side channels, upstream reaches) actually produce the juvenile fish that later become catchable adults and therefore may require protection.

2. FISH HABITAT STUDY

Title: Effects of Channel Modification on Fish Habitat in the Upper Yellowstone River

Principal Investigators: Dr. Zack Bowen (Ecosystem Dynamics Science Program Director), Ken Bovee (Hydrologist), Dr. Terry Waddle (Hydrologist), US Geological Survey-Biological Resource Center, Fort Collins, Colorado.

Goal: Determine whether certain types of channel modification are potentially more detrimental to fish populations than others.

Abstract:
A two-dimensional hydrodynamic simulation model was coupled with a geographic information system (GIS) to produce a variety of habitat classification maps for three study reaches in the upper Yellowstone River basin in Montana. Data from these maps were used to examine potential effects of channel modification on shallow, slow current velocity (SSCV) habitats that are important refugia and nursery areas for young salmonids. At low flows, channel modifications were found to contribute additional SSCV habitat, but this contribution was negligible at higher discharges. During runoff, when young salmonids are most vulnerable to downstream displacement, the largest areas of SSCV habitat occurred in side channels, point bars, and overbank areas. Because of the diversity of elevations in the existing Yellowstone River, SSCV habitat tends to be available over a wide range of discharges. Based on simulations in modified and unmodified sub-reaches, channel simplification results in decreased availability of SSCV habitat, particularly during runoff. The combined results of the fish population and fish habitat studies present strong evidence that during runoff, SSCV habitat is most abundant in side channel and overbank areas and that juvenile salmonids use these habitats as refugia. Channel modifications that result in reduced availability of side channel and overbank habitats, particularly during runoff, will probably cause local reductions in juvenile abundances during the runoff period. Effects of reduced juvenile abundances during runoff on adult numbers later in the year will depend on (1) the extent of channel modification, (2) patterns of fish displacement and movement, (3) longitudinal connectivity between reaches that contain refugia and those that do not, and (4) the relative importance of other limiting factors.

The goal of the fish habitat study was to evaluate the effects of channel modification on shallow depth, slow current velocity (SSCV) habitat. We focused on SSCV habitat because shallow and slow water habitats (with varying quantitative definitions in different studies) have been demonstrated repeatedly as important growth and survival factors for young fish (Welcomme 1979; Sedell and others 1984; Kwak 1988; Nehring and Anderson 1993; Bovee and others 1994; Scheidegger and Bain 1995; Copp 1997; Bowen and others 1998; Freeman and others 2001; Zale and Rider 2003). The larvae and early juvenile lifestages of virtually all species share the common characteristics of small size, poor swimming capability, and reliance on zooplankton, small insects, and detritus as primary food items (for example, Chapman 1966; Hall and others 1979; Papoulias and Minckley 1990, 1992; Muir and others 2000). Shallow water, slow current velocity habitats found in backwaters and side channels provide refuge from high current velocities in main channel areas (Hjort and others 1984) that can displace small fish downstream, particularly during periods of high discharge (Ottaway and Clarke 1981; Ottaway and Forest 1983). These SSCV habitat areas typically provide favorable feeding conditions and shallow water in combination with structural cover which can reduce the risk of predation for small fish (Schlosser 1991; Ward and Stanford 1995).

The study examined the effects of bank armoring and flow training structures on the availability of SSCV habitat. The mapped representative study reaches in the upper Yellowstone River and used hydrodynamic models and hydrograph data to describe the availability of SSCV habitat during different hydroperiods. They focused on availability of SSCV habitat because of its function as a refugium and nursery habitat for young fish.

Completion Date/Products: March 2003. Report 5. *Effects of Channel Modification on Fish Habitat in the Upper Yellowstone River*.

Access to Data: The *Effects of Channel Modification on Fish Habitat in the Upper Yellowstone River* report may be viewed by visiting the Task Force website at: www.upperyellowstonerivertaskforce.org.

Need for Further Study: This study focused on availability of shallow, slow current velocity habitat because of its importance as a refugium and nursery for juvenile salmonids, particularly during periods of high discharge. Other habitat requirements include spawning habitat, adult habitat, and overwintering habitat. Populations of trout can be limited by a deficiency in any of these. Flow regime, especially summer low flows, are important in determining trout biomass. Low flows during summer that result in dewatering of important habitats, increased water temperatures, or adverse affects on water quality could affect survival or limit carrying capacity. Similarly, the condition of fish at the beginning of winter and availability of overwintering habitat are very important in determining overwinter survival. Additional research and population monitoring should strive to determine which factors, including physical habitat, are most directly regulating numbers of adult salmonids.

VI. WILDLIFE (BIRD) ANALYSIS

Title: Riparian Habitat Dynamics and Wildlife along the Upper Yellowstone River

Principal Investigators: Dr. Andrew Hansen (Associate Professor of Ecology), Dr. Jay Rotella (Ecology Department Head, Associate Professor), Lurah Klaas and Danielle Gryskiewicz (research assistants), Montana State University, Bozeman, Montana.

Goal: Determine relationships between riparian habitat dynamics and riparian avifauna, often used as indicators of habitat integrity for wildlife.

Abstract: In this study, we collected bird and vegetation data within riparian zones along the river to determine the attributes of avian and shrub communities within eight vegetation successional stages and three geomorphological reach types. Additionally, we used aerial photos from 1948 and 1999 to investigate change in riparian vegetation over time. Finally, we used statistical models to predict bird richness across portions of the study area. A total of 78 bird species and 15 shrub species were recorded overall. We found that the moderately confined and braided reaches supported the highest bird abundance, diversity, and richness. Within the braided reach, the mature cottonwood stages supported the highest bird richness, diversity, and abundance. The best model for predicting richness included successional stage, which explained 51 percent of the variation. The braided reach exhibited the highest predicted richness because it supported the most mature cottonwood forest. Analysis of the areal distribution of riparian vegetation over time showed different responses within the braided and moderately confined reaches. Braided reaches experienced an increase in both younger and older successional stages, whereas the moderately confined reach experienced a decline in younger stages and an increase in older stages. Land managers interested in maintaining avian diversity should consider the importance of periodic flooding in maintaining the full range of successional stages of riparian vegetation in this river system.

Completion Date/Products: September 2003. Report 8. *Riparian Dynamics and Wildlife Along the Upper Yellowstone River,* which details changes in avian abundance and distribution between 1950 and 2000, identifies habitat features that support high species diversity, and documents the importance of current riparian habitats for wildlife. Models of avian distribution and abundance based on channel features and vegetation characteristics. Maps of riparian habitat and avian species distribution and abundance for 1950 and 2000.

Access to Data: The *Riparian Dynamics and Wildlife Along the Upper Yellowstone River* report may be viewed by visiting the Task Force website at: www.upperyellowstonerivertaskforce.org.

Need for Further Study: Additional studies would be very beneficial for providing understanding about the consequences of river management on wildlife communities. Because the maintenance of the full suite of successional stages is crucial to maintaining biodiversity, investigations which better quantify the past and possible future effects of bank stabilization on flood dynamics and riparian succession would be helpful in

developing possible management scenarios for the river. Furthermore, studies which evaluate the combined effects of different types of bank stabilization and rural residential development on the demography of bird populations and other wildlife species may provide insight into some of the possible causes and consequences of different human activities along the river. With this information, managers could then use simulation models to project the likely future effects of alternative management scenarios on wildlife populations. Additionally, evaluation of the biodiversity value of the upper Yellowstone River relative to the other major river systems of the Greater Yellowstone Ecosystem may provide information on the importance of this river system for maintaining regional biodiversity. Finally, this study focused on breeding riparian birds. More study is needed to understand patterns of abundance and diversity for mammals, amphibians, and reptiles, as well as for migrating and wintering birds.

VII. SOCIO-ECONOMIC ASSESSMENT

Title: Socio-Economic Assessment of the Upper Yellowstone River Valley

Principal Investigators: Edward Harvey (Project Leader), Andy Fritsch (Data Collection/ Analysis), BBC Research & Consulting, Denver, Colorado.

Note: Since the publication of this document, Ed Harvey and Andy Fritsch have formed their own consulting firm and can be contacted at Harvey Economics in Denver, Colorado.

Goal: Characterize the human environment within the Upper Yellowstone River Study Area.

Introduction:

Ed Harvey and his research team conducted a socio-economic assessment of the Upper Yellowstone River Valley in 2002. He initiated data collection for this process in February 2002 with a public meeting to engender input from the stakeholders in the study area. The researcher team completed data compilation in September 2002 with another public meeting to review the assessment's preliminary results. They typically focused on the river corridor from Springdale through to Gardiner in Park County. For certain research, it was appropriate to examine a broader study area than that, at times including the lowlands and foothills of the Upper Yellowstone River Valley and at other times relying on the whole of Park County. Economic and demographic data is generally reported for Park County as a whole, and the bulk of county activity occurs in the river corridor.

Objectives:

This study was intended to provide a socioeconomic portrait of the Upper Yellowstone River Valley, which runs from Gardiner downstream to Springdale in Park County. The Task Force and Corps set out the following objectives for the Upper Yellowstone River Socioeconomic Assessment:

1. Identify recent and longer-term historical trends in social values and cultural heritage and resources.
2. Identify present key stakeholder groups and the special interests they represent.
3. Assess current social values of stakeholders for the management of the study area.

4. Assess current cultural values and resources of stakeholders.
5. Establish a baseline characterization of the current economic and demographic activity within the study area, with focus on economic and demographic trends, changes in public services and displacement of farms.
6. Describe changes in land use and land use plans in recent years to provide a baseline picture of past trends.
7. Depict current and historic management actions on the Upper Yellowstone River, with a focus on institutional frameworks, bank stabilization projects, water rights and irrigation uses.
8. Consider the secondary by-products of growth and change in the study area by assessing potential change to the character of the resident population with changes in the elements of local quality of life.
9. Describe the existing 404 permit process and project what might be expected for social and economic conditions in 2025 if current river management protocol remains as it stands today.
10. Provide ample opportunity for the public to give input into the socioeconomic assessment process.

Executive Summary:

The research results of the socioeconomic study are summarized by topic as follows:

Demographic Trends

Park County's population has generally grown in fits and starts since the county's beginnings in the late 1800s. Growth slowed in the latter half of the 20th century but picked up again toward the end of the millennium.

Park County's population and housing stock are growing moderately. Almost all growth is occurring outside but surrounding Livingston and in more rural areas of the county. Minimal annexation around Livingston and a preference for rural lifestyles likely explain this phenomenon.

Accounting for about eight percent of the total population, seasonal residents are a notable economic presence in the county.

Residents and businesses perceived the river as being vitally important to the economy and as an amenity to local quality of life, which attracts and holds residents and businesses. The river is also a central, valuable part of the visitor's experience.

The no-action scenario indicates that county population will grow from about 15,700 persons to 19,000 persons by the year 2025 or 21 percent with housing units growing slightly faster.

Economic Trends and Values

The economy of Park County has evolved with the ebb and flow of different industries, including ranching, mining, timber, railroad transportation and tourism. Ranching has been a constant, while tourism is on the ascendancy as of 2002.

Personal incomes have risen quite substantially in the past 30 years; most growth has occurred in the nonfarm sectors. The greatest increase has come from non-wage components of income, including dividends, interest, rent and transfer payments. These non-wage elements of income are disproportionately high in Park County as compared with the State of Montana.

Personal incomes will more than double with inflation, but grow only modestly on a constant dollar basis. Wealth increases will lead other income measures.

The household and business surveys indicated that locals perceived tourists, ranchers and longtime residents as important to the Park County economy. River-related and other tourist-related businesses were also considered important economic contributors. Spring creeks were not well understood by residents or businesses. New and seasonal residents were viewed as generally less important to the economy than the other groups.

Tourism is clearly the strongest element of the Park County economy in 2002, generating sales, jobs and income for many residents and businesses.
Residents and businesses perceived overuse of the Upper Yellowstone River as a major problem, but visitors did not agree.

Fishing, whitewater, the wild and undeveloped feel of the river, relatively little manmade noise, adequate public access, and the presence of ranching all contributed positively to the visitor experience.
If visitors could plan their trip over again, they would stay longer in Park County.

Residents and businesses agreed, and visitors confirmed, that riverbank vegetation is a vital part of the river and visitor experience. Scenery along the river generally contributes very positively to the visitor experience.

Ranching in 2002 is a relatively modest, stable component of the Park County economy. However, ranching is still important to Park County, generating income and earnings for hundreds of ranchers, their employees and their families and spreading secondary effects of local spending throughout the area.

Out-migration of longtime ranchers is driven mostly by increasing land prices ($25,000 to $35,000 per animal unit) and adverse ranching economics. High land values make it advantageous to relocate ranches to cheaper locales or to retire. This may prompt concern on the part of local residents who value ranchers' contributions to the community, history and attractiveness of the area.

Park County employment is projected to increase from about 8,900 persons in 2000 to 12,600 persons by 2025 under the no-action scenario. This 40 percent increase will occur mostly in tourism-related economic sectors.

Social/Cultural Values

Residents of Park County, from the original American Indians to today's inhabitants, have valued the river for many reasons, including drinking water, transportation, recreation and contributions to the scenery.

The communities of Park County have been strong and civically oriented from the beginning. Traditionally, ranchers have played and continue to play an important role in community leadership.

Ranchers and longtime residents were perceived to be the most important groups contributing to the Park County social and cultural environment. Tourists, new permanent residents, and river-related and other tourist-related businesses were also viewed as making important contributions. Seasonal residents and spring creek related activities were seen as less important.

Residents appreciated the contribution tourists make to the community through their patronage of local activities, arts, and cultural enterprises, and through the cultures and customs they bring with them.

The beauty of the Upper Yellowstone River is paramount in its contributions to quality of life in Park County.

Fishing and other river-related recreational activities, like rafting and floating, are very important components of the quality of life here in Park County.

Even though the river contributes much to the Park County quality of life through its recreation and its beauty, residents were divided as to whether the river is the single most important physical element of the community.

Quality of life perceptions are summarized as follows:

Land Use Trends

Current land use patterns are the result of the economic evolution and movement of people in and out of the area over time.

Residential development and land use change in the river valley is perceived to be somewhat of a threat to the quality of life, but visitors do not see it as detraction yet. In fact, change has been rather slow historically.

Park County and the Upper Yellowstone River study area have experienced changes in land use patterns in the past 30 years. Population density changes, coupled with land use maps, point to moderately increased urbanization within the river corridor study area.

Wealthy, out-of-state landowners are replacing Montana ranchers at a relatively slow rate. Large parcels of ranchland are remaining intact or growing larger, while some smaller parcels have been subdivided to make room for 5-, 10-, 20- and 40-acre parcels for residential development.

Both households and businesses more often than not believed that property owners should not have a right to subdivide and build in the floodplain. Visitors had mixed views on this issue.

Subdivisions have centered along the Upper Yellowstone River and its tributaries and along local infrastructure such as roads and communications lines. This development has supplanted some shrublands, grasslands and forestlands.

The river corridor clearly has the greatest potential for growth, given the subdivided parcels there, but the entire study area has some growth potential that will depend upon infrastructure development.

National and local economic conditions will drive development. If the economy booms again, there will be increased demand for second homes in the Paradise Valley. If the economy slows down, residential growth will slow, as well.

Development will continue to occur in the river corridor over the next 25 years in previously approved subdivisions, under the no-action scenario.

River Management Issues

The stakeholder interview process suggested that there are a number of different stakeholder groups within the study area with different views about use of the Yellowstone River, threats to the river, management viewpoints and underlying basic values.

The water level in the river was considered important to the economy, and droughts were perceived as more negative than floods. When visitors thought about water levels in 2002, they viewed them as a positive part of their visitor experience generally.

There is widespread recognition of the importance of the Yellowstone River to the area and some recognition of the need to compromise to achieve a good management system.

Flood and erosion management along the Upper Yellowstone River have existed since white settlement, and most bank stabilization has occurred in the section of the river between Emigrant and Livingston. Floods have traditionally stimulated periods of bank stabilization efforts and installations of new structures on the river.

Physical modifications to the course of the river are primarily regulated by a combination of the USACE (at the federal level), MTDNRC (at the state level) and PCD (at the local level). Historic changes to the river were regulated by transportation or agricultural departments or not at all.

The volume of water and diversions from the river are principally regulated by MTDNRC.

Floodplain development and modifications are regulated primarily by local floodplain managers implementing state and federal requirements while considering local circumstances.

More households and businesses agreed than disagreed that prior river management — defined in the surveys as dikes, barbs, riprap, etc. — has been ineffective and inconsistent.

As of 1998, for the Gardiner to Springdale river corridor, nine percent of the riverbank was riprapped, and there were more than 100 rock barbs and an additional 100 rock jetties. Eroding banks were estimated at 12 percent of the total riverbank in the study area.

The changes in rock jetties and barbs were substantial between 1987 and 1998. Riprap also increased somewhat. The largest overall change occurred from Pine Creek Bridge to Carters Bridge.

There are contradictory views among stakeholder groups concerning the benefits of riprap and river management, subdivisions along the river, cattle grazing and lesser issues.

Residents and businesses generally agreed that management of the Upper Yellowstone River for flooding and erosion is the best thing for the overall economic and social well being of the county. Visitors believed that an unmanaged, free-flowing river is best.

Using manmade structures, such as riprap, levees and dikes, to protect private property was supported by the majority of residents and businesses, though 30 percent disagreed. Less than half the visitors were opposed to these structures, and existing structures have generally not detracted from the visitor's experience.

There are 2,277 active water rights in the study area; agriculture and stock watering account for 86 percent of rights, while fish, wildlife and recreation purposes account for 5 percent of the rights granted. The remaining nine percent is for domestic use, lawn and garden use, mining, power generation, industry, commerce, municipal use and fire protection.

The total quantified water rights amount to 2.2 million acre-feet per year and of this, 1.53 million are dedicated to fish, wildlife and recreational purposes mostly held by Montana Fish, Wildlife and Parks Department.

Consumptive water use for hay is about 25 inches per acre per year. Four acre-feet must be diverted to supply an acre-foot of consumptive use to study area crops.

Completion Date/Products: December 2002. Report 3. *Socio-Economic Assessment of the Upper Yellowstone River Valley.*

Access to Data: The *Socio-Economic Assessment of the Upper Yellowstone River Valley* may be viewed by visiting the Task Force website at: www.upperyellowstonerivertaskforce.org.

Need for Further Study: See Report 3, Exhibit 9b-1 Issues and Follow Up, Task 9B, page 2.

ACKNOWLEDGEMENTS

The positive strides that the Task Force has taken over these past six years are due in large part to strong internal and external partnerships with many dedicated individuals and organizations. The Task Force feels that this commitment came about because of our community's, our State's, and our nation's concern for the Yellowstone River.

We thank Montana's Governors Racicot and Martz for their steadfast support and confidence in the Task Force. We also thank Montana's Congressional Delegation, who worked cooperatively to lend support and crucial financial assistance to the upper Yellowstone River effort.

We thank Liz Galli-Noble, Task Force Coordinator, who provided tireless personal dedication and much-needed organization and professional skills to the project. Her hiring was a turning point and crucial element for our project completion and success. We also acknowledge Michael Gilbert for playing a similar vital role as project manager for our US Army Corps of Engineers partner.

Special thanks are due to the scientists/technical experts making up our Technical Advisory Committee. This project could not have been accomplished without the dedication and long-term support of: Dr. Duncan Patten, Tim Bryggman, Chuck Dalby, Tom Hallin, Brad Shepard, and Jim Robinson. We also thank the research team leaders, who went well beyond their contracted duties to help educate the Task Force and public: Dr. Richard Aspinall, Dr. Zack Bowen, Ken Bovee, Steve Holnbeck, Dr. Andy Hansen, Edward Harvey, Dr. Mike Merigliano, Chuck Parrett, Tom Pick, Mary Louise Polzin, and Dr. Al Zale. Thanks are also given to agency personnel for their technical assistance: Rob Hazlewood, Peter Ismert, George Jordan, Eric Morrison, Pat Newby, John Remus, and Allan Steinle.

For their commitment and enduring support of the Task Force, thanks are offered to the Park Conservation District Board. We thank Shawnda Hildebrand and Amy Miller for their dedicated administrative and accounting assistance. We also acknowledge Mary Ellen Wolfe, Mary Vandenbosch, Kelly Wade, Lara Desmarais, and Jacqueline Isaly for their administrative help on the project.

For their financial and/or staff support of the upper Yellowstone River effort we thank: DNRC (WRD and CARDD), DEQ, FWP, MDT, MSU, U of M, Corps, BLM, EPA, FEMA, NRCS, USGS, and YNP.

Finally, we give a very special thanks to the citizens and landowners of Park County for showing us support, trust, and patience over these six long years.

APPENDICES

APPENDIX A. ACRONYMS

Task Force	Governor's Upper Yellowstone River Task Force
BLM	Bureau of Land Management
CD	Conservation District
Corps	US Army Corps of Engineers
DEQ	Montana Department of Environmental Quality
District / PCD	Park Conservation District
DNRC	Montana Department of Natural Resources and Conservation
DNRC-CARDD	DNRC-Conservation and Resource Development Division
DNRC-WMB	DNRC-Water Management Bureau
DNRC-WRD	DNRC-Water Resources Division
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ESRI®	Environmental Systems Research Institute, Inc.
FWP	Montana Department of Fish, Wildlife, and Parks
FY	Fiscal Year (used by the federal government: October 1 to September 30)
GIAC	Geographic Information and Analysis Center, Montana State University
GIS	Geographic Information Systems
GPS	Global Positioning System
GYC	Greater Yellowstone Coalition
GYE	Greater Yellowstone Ecosystem
HB 223	House Bill 223 Grant (DNRC)
MDT / DOT	Montana Department of Transportation
MSU	Montana State University
MTCFRU	Montana Cooperative Fisheries Research Unit (MSU)
MWCC	Montana Watershed Coordinator Council
NAWQA	National Water Quality Assessment (USGS)
NEPA	National Environmental Policy Act
NPS	National Park Service
NRCS	Natural Resources Conservation Service (USDA)
NRIS	Natural Resources Information System (Montana State Library)
NWI	National Wetland Inventory (USFWS)
RDGP	Reclamation and Development Grant Program (DNRC)
RFP	Request For Proposal
SAMP	Special Area Management Plan
Start Up	Task Force Start Up Grant (DEQ)
TAC	Technical Advisory Committee
TMDL	Total Daily Maximum Load (EPA/DEQ)
TNC	The Nature Conservancy
U of M	University of Montana
USDA	US Department of Agriculture
USDI	US Department of the Interior
USFS	US Forest Service
USFWS	US Fish and Wildlife Service
USGS	US Geological Survey
USGS-BRD	USGS-Biological Resources Division
WPA	Watershed Planning and Assistance Grant (DNRC)
YNP	Yellowstone National Park
YRCDC	Yellowstone River Conservation District Council
205 Study	Section 205 of the Flood Control Act of 1948, as amended (Corps)
319 Grant	Section 319 Water Quality Grant (DEQ)

APPENDIX B. GOVERNOR'S EXECUTIVE ORDER NO. 21-01

State of Montana
Office of the Governor

Executive Order No. 21-01

EXECUTIVE ORDER CONTINUING THE
GOVERNORS UPPER YELLOWSTONE RIVER TASK FORCE

WHEREAS, the upper Yellowstone River and its tributaries, herein defined as that reach of the river (including tributaries) beginning at the Yellowstone Park boundary and extending downstream to the bridge crossing the river at Springdale, is a national treasure; and

WHEREAS, the recreational opportunities provided by the river provide significant contributions to Montana's economy; and

WHEREAS, the river is essential to Montanans who live along it, providing water for agricultural, domestic and commercial purposes; and

WHEREAS, the extreme floods of 1996 and 1997 created hardships for communities and Montana citizens who live adjacent to the river, causing damage to property and stream banks, as well as some nationally-renowned spring creeks in Paradise Valley; and

WHEREAS, previous decades of work done along the river for

purposes of flood control, construction of transportation corridors and other purposes have altered the natural flood plain of the river, with the potential to exacerbate damage to private and public property and fish habitat; and

WHEREAS, there is a need for a more comprehensive planning effort involving citizens, communities, and government agencies that have an interest in the upper Yellowstone River to ensure that future projects that affect the river are planned and conducted in a manner that will preserve the integrity, beauty, values, and function of the upper Yellowstone River for Montanans now and in the future.

NOW THEREFORE, I, JUDY MARTZ, Governor of the State of Montana, by virtue of the authority vested in me, do hereby continue the Upper Yellowstone River Task Force.

I. PURPOSE

A. The Upper Yellowstone River Task Force shall:

1. Provide a forum for the discussion of issues that effect the Upper Yellowstone River basin, particularly, to bring together landowners, sportsmen and sportswomen, and community leaders to develop a shared understanding of the issues and competing values and uses that impact the Upper Yellowstone River;

2. meet on a regular basis, the frequency to be determined by Task Force members, for the purpose of encouraging a comprehensive approach to action taken

along the Yellowstone River to ensure that its integrity remains intact while balancing the needs of communities and landowners to protect property;

3. seek or encourage others to seek grants, funds or other cooperative arrangements to implement recommendations of the Task Force; and

4. prepare an annual report to the Governor on the progress of the task force.

II. COMPOSITION

The Upper Yellowstone River Task Force shall be composed of no more than 12 voting members including representatives of the following: local businesses, property owners, farmers and ranchers who live along the river, the angling community, a conservation group or groups, Park County, the City of Livingston and the local Conservation District. Representatives of the Army Corps of Engineers, Departments of Natural Resources and Conservation, Environmental Quality, Fish, Wildlife & Parks, and Transportation shall serve as ex-officio members.

III. DURATION

This Task Force shall remain in existence for two years from the date of effect unless extended or terminated by subsequent Executive Order.

This Order is effective immediately.

GIVEN under my hand and the GREAT SEAL of the State of Montana, this 21st day of August, 2001.

JUDY MARTZ, Governor

ATTEST:

BOB BROWN, Secretary of State

APPENDIX C. DECISION-MAKING PROCESSES and POLICIES

The Task Force discovered very early on that they needed to establish rules about how they would conduct business, in order to function equitability, efficiently, and effectively as a group. Of the many rules/processes/protocols adopted by the Task Force, perhaps the two that were most cited and relied upon over the years were the *Task Force Ground Rules* and *Steps for Formal Action on Task Force Recommendations* (see pages 92-94 of this report).

The Task Force steadfastly sought consensus regarding policy decisions and recommendations. Consensus was defined as

> *"... acceptance of an agreement. Members may not agree with all aspects of an agreement; however, they do not disagree enough to warrant opposition to the agreement. When Task Force members accept an agreement, they commit themselves to implementing the agreement."*

Up until their last meeting in August 2003, Task Force members constantly reminded each other that

> *"Participants who disagree with a proposal are responsible for offering a constructive alternative that seeks to accommodate the interests of all other participants."*

This clause in their ground rules helped Task Force members—who admittedly represented disparate and somewhat contentious constituencies within the community—to articulate their objection to a proposed recommendation and to try and come up with a workable compromise that satisfied everyone's needs. This unique application of the consensus process was not always successful. However, for the vast majority of issues addressed by the Task Force, it worked very well.

The recommendations adopted and the science generated by the Task Force have built a foundation for Upper Yellowstone River Basin, upon which many future actions will likely be based. Completion of the Task Force effort is not an end. It is really just the beginning for the Upper Yellowstone. It is now up to other interested citizens and governmental agencies to take the next step; to build on the successes of the Task Force and to further address issues where the Task Force could not reach consensus.

Upper Yellowstone River Task Force Ground Rules

Participation

1. The discussions of the Upper Yellowstone River Task Force will include the perspectives of individuals and organizations whose interests may be affected by the recommendations or activities of the Task Force.

   Voting Task Force members represent the following interests:

   - Local businesses
   - Property owners
   - Ranchers
   - Angling community
   - Conservation groups
   - Park County
   - City of Livingston
   - Park Conservation District

   Ex-officio members of the Task Force represent the following government agencies:

   - Montana Department of Environmental Quality
   - Montana Department of Fish, Wildlife and Parks
   - Montana Department of Natural Resources and Conservation
   - Montana Department of Transportation
   - US Army Corps of Engineers
   - National Park Service—Yellowstone National Park
   - US Forest Service—Livingston Ranger District
   - US Forest Service—Gardiner Ranger District

The Task Force will actively encourage the inclusion of a variety of perspectives in the following ways:

a) Members will candidly identify and share their values and interests and will do so as soon as possible.

b) Members will inform their constituency of the activities of the Task Force, seek the advice of their constituency and make every effort to speak for their constituency.

c) The Task Force will invite individuals with perspective not represented by members to discuss their views with the Task Force.

d) Task Force meetings will be open to the public. Individuals may request time on the Task Force agenda to discuss their concerns.

e) Notice of meetings will be provided to the news media.

f) A mailing list will be established and, upon request, individuals will receive notices of upcoming meetings and summaries of previous meetings.

g) The Task Force will hold special meetings at different locations, when needed, to share information and gather ideas, comments and concerns about Task Force proposals.

h) The Task Force will periodically prepare a summary of its activities and distribute this summary to the news media and individuals on the mailing list.

2. Task Force members agree to make every effort to attend every meeting. If a member is unable to attend a meeting, he or she may make arrangements for an alternate to attend the meeting, but should ensure that the alternate is fully informed of the issues under consideration and progress to date.

Decisions/Agreements

1. The Task Force will seek consensus agreements regarding policy decisions and recommendations. Consensus is defined as acceptance of an agreement. Members may not agree with all aspects of an agreement; however, they do not disagree enough to warrant opposition to the agreement. When Task force members accept an agreement, they commit themselves to implementing the agreement.

2. Participants who disagree with a proposal are responsible for offering a constructive alternative that seeks to accommodate the interests of all other participants.

3. Business or monetary decisions may be made by a voice vote of a majority (seven voting members) of the Task Force. The Chair may vote.

Communication with the Media

1. The Chair will be the spokesperson for the Task Force in communications with the media.

2. Each participant is free to speak to the media regarding their own view on the work of the Task Force. No participant may characterize the views of other participants expressed in this process to the media or in other forums.

3. With the exception of notices of meetings or events, written statements distributed to the news media will be reviewed by the Task Force.

Roles and Responsibilities

1. The Task Force Chair, will serve as the contact person for the Task Force and liaison with government agencies. The Chair, with the consent of the Task Force, is responsible for conducting and calling meetings, clarifying voting issues and appointing subcommittees, and providing direction to the Task Force Coordinator.

2. The Vice-Chair will assume the duties of the Chair in his absence.

3. The Coordinator will: help the participants design an appropriate process; coordinate pre- and post-meeting logistics; prepare documents to maintain an objective record of the process, including meeting summaries and annual and final reports; distribute agendas and meeting summaries; encourage everyone to participate; and moderate discussions as needed. The Coordinator is nonpartisan and is not an advocate for any particular interest or outcome.

Technical Advisory Committee

1. The overall goal of the Technical Advisory Committee (TAC) is to provide recommendations to the Task Force when requested based on the results of the scientific investigations. The TAC is given both broad direction and specific missions by the Task Force, and has the flexibility to determine how best to accomplish its job. The TAC has no authority to make policy decisions or recommendations on behalf of the Task Force; its role is to work as directed by the Task Force to ensure:
    - The right questions are asked;
    - The best approach and methods are used to answer questions;
    - The data collected are objective, defensible and trustworthy; and
    - The answers provided are understandable and relevant.

Steps for Formal Action on Task Force Recommendations

On April 29, 2003, the Governor's Upper Yellowstone River Task Force adopted the following process for development of recommendations and for adoption of final recommendations to be submitted to the Governor.

1. General Discussion Session to Develop Recommendations

a. The Task Force will convene meetings to consider proposed recommendations that pertain specifically to the *Topics of Consideration* list previously adopted. The Task Force Chair will oversee and run each meeting according to the procedures set forth below. Issues, comments, concerns, and draft recommendations related to the *Topics of Consideration* under discussion, which have been raised and recorded after the eight research presentations, will be revisited by the Task Force and the public. New comments, concerns, and recommendations may also be raised and recorded.

b. Task Force members speak first and when they have no further comments, members of the public will be asked for their comments. The Task Force Chair is responsible for ensuring comments remain concise and that they relate to the Topics of Consideration under specific discussion.

c. Upon conclusion of the comment and discussion period in each meeting, the Task Force will propose recommendations formally in accordance with the procedures set forth in Paragraph 2 below.

2. Formal Actions on Recommendations

a. All recommendations must be proposed by a voting Member of the Task Force and must be clearly stated and recorded.

b. The Task Force Chair restates each recommendation made and asks the Task Force for final concerns and questions relating to each recommendation.

c. The Task Force Chair calls for consensus on each recommendation made.

d. The Task Force formally adopts recommendations that achieve consensus, subject only to modification at the final meeting as set forth in Paragraph 3 below.

e. If any recommendation fails to achieve consensus, the Task Force may continue to consider that recommendation and may again seek consensus after further discussion, may defer action on the recommendation until a future meeting, or may decide to abandon the effort to obtain consensus on that particular recommendation. (Note: Task Force Ground Rules: Participants who disagree with a proposal are responsible for offering a constructive alternative that seeks to accommodate the interests of all other participants.)

3. Adoption of Final Set of Recommendations

a. Prior to finalizing its recommendations to be forwarded to the Governor, the Task Force will accept public comment (written only) on the recommendations previously adopted in Step 2.

b. At its last meetings during which the Task Force finalizes the complete set of recommendations to be forwarded to the Governor, Task Force Members may not propose new recommendations but may propose modifications, amendments, or deletion of any of the previously adopted recommendations in Step 2 for any reason, including but not limited to:

   i. To address concerns expressed by a Task Force Member's constituency or the public about the original recommendation;
   ii. To eliminate potential conflicts between recommendations;
   iii. To delete redundant or duplicative recommendations;
   iv. To integrate scientific studies and data more efficiently into the recommendations; or
   v. To correct clerical, typographic, transcription, grammatical, or rhetorical errors.

c. The Task Force will adopt for transmittal to the Governor a complete set of recommendations based on the individual recommendations adopted by consensus pursuant to Step 2 above, as such recommendation may be modified, amended, or deleted by consensus pursuant to Step 3b above.

d. The final set of recommendations must be approved by the Task Force for transmittal to the Governor by consensus.

APPENDIX D. FINANCIAL STATEMENT

The Governor's executive order directed the Task Force "… to seek or encourage others to seek grants, funds or other cooperative arrangements to implement recommendations of the Task Force… ." Throughout their tenure (1997 to 2003), the Task Force did just that, actively pursued funding for the upper Yellowstone River research effort, educating the public, and supporting Task Force administration and operation.

Table 4 (pages 96 and 97) summarizes the entire project budget from beginning (1997) to end (December 2003).

The Task Force has benefited greatly from strong partnerships with a wide array of organizations and agencies. Many community members; local, state, and federal governmental agencies; and academics have generously donated technical support and assistance in each and every phase of project development and implementation. The $1,094,706 in-kind and match total shown in *Table 4* —which makes up 39 percent of the entire project budget—illustrates how monumental these contributions have been for the Task Force. Further, this table includes only documented contributions. Many local citizens and technical experts have *informally* donated hundreds of hours to the project, which was not documented. The Task Force can do little more than to give them their sincere thanks and recognize their efforts in this report.

Table 4. Governor's Upper Yellowstone River Task Force Budget Summary

This table summarizes costs associated with Task Force activities from inception (November 1997) to project completion (December 2003).

Component / Task	Costs & Appropriated Funding (1997 - 2003; in dollars)			
	Grant Funding	Match or In-Kind Contribution	Other Funding Sources	Total
1. Park Conservation District Administration				
Park Conservation District Administration (8 or 10 % fee)	24,000 (RDGP) 2,944 (319 #1) 4,268 (319 #2) 4,000 (319 #3) 12,200 (319 #4) 3,108 (Start Up) 1,000 (BLM) 483 (223) 1,000 (WPA) 100 (Ed Grant) 3,000 (EPA-RGI) 500 (223)	0	0	
Subtotal	**56,603**	**0**	**0**	**56,603**
2. Task Force Project Administration, Coordination, Education, & Management				
Task Force Administration / Operations **Task Force Coordinator (all duties)** **Outreach and Education** Public meetings, tours, workshops. **Data Dissemination/Report Publication** Website, technical writing/editing, printing, mailings. **Management Recommendation Development** ***Governor's Conference for the Upper Yellowstone River***	22,500 (RDGP) 37,056 (319 #1) 53,732 (319 #2) 40,000 (319 #3) 110,000 (319 #4) 900 (Ed Grant) 28,297 (Start Up) 7,000 (USEPA/MSU) 5,000 (DNRC-WRD) 4,500 (223) 1,500 (FEMA/DNRC)	92,999 (TF) 16,000 (State) 33,333 (DNRC)	4,385 (registration fee)	
Table 4 continued				
Subtotal	**310,485**	**142,332**	**4,385**	**457,202**
3. Baseline Data Acquisition and Analysis				
Physical Features Inventory	2,100 (WPA)	1,200 (PCD) 8,000 (NRCS)	25,700 (Corps) 7,015 (TF/State) 7,000 (NRCS)	51,015
Aerial Photography	10,000 (HB223)	11,233 (Start Up)	4,500 (State)	25,733

Table 4 continued.

Component / Task	Costs & Appropriated Funding (1997 - 2003; in dollars) Grant Funding	Match or In-Kind Contribution	Other Funding Sources	Total
Geomorphic Analysis	22,386 (RDGP)	237,741 (DNRC)		260,127
Historic Photo Rectification Project	27,000 (EPA-RGI) 27,314 (RDGP)		1,800 (MSU, EPA-STAR) 14,020 (TF, 319)	70,134
Hydrology/Hydraulic Analysis	108,250 (RDGP)	168,250 (USGS)	60,000 (MDT) 6,500 (Start Up) 6,500 (Corps)	349,500
Topographic/Contour Mapping	0	0	180,000 (Corps)	180,000
NWI Riparian/Wetlands/Land Use Mapping	0	19,500 (USFWS)	29,422 (Corps)	48,922
Riparian Trend Analysis	94,993 (RDGP) 6,017 (HB223)	0	54,900 (Corps)	155,910
Fisheries Analyses				
Fish Populations Study	0	0	97,536 (Corps)	97,536
Fish Habitat Study	0	205,000 (USGS)	200,000 (Corps)	405,000
Current Watershed Land Use Assessment	9,000 (WPA)	40,000 (NRCS) 7,950 (GIAC)	0	56,950
Historic Watershed Land Use Assessment	75,000 (MSU, EPA-STAR)	0	0	75,000
Wildlife (Bird) Assessment	0	0	106,000 (Corps) 9,000 (BLM)	115,000
Socio-Economic Assessment	0	6,500 (DEQ)	145,312 (Corps)	151,812
Subtotal	**$382,060**	**$705,374**	**$955,205**	**$2,042,639**
4. General Project Support / Match	0	142,000 (RDGP/Corps) 105,000 (Corps Budget) 3,500 (FWP)	0	**250,500**
Total Project Costs	**$749,148**	**$1,094,706**	**$959,590**	**$2,806,944**

TF = Task Force
FWP = Montana Fish Wildlife and Parks
State = contributions from Montana DEQ, MDT, FWP
RDGP = Reclamation and Development Grant Program
Start Up = Task Force Start Up Grant (DEQ)
DNRC = Department of Natural Resources and Conservation
MDT = Montana Department of Transportation
EPA = Environmental Protection Agency

USFWS = US Fish Wildlife Service
319 = DEQ Section 319 Water Quality Grant
HB223 = DNRC House Bill 223 Grant
NWI = National Wetland Inventory
USGS = US Geological Survey
NRCS = Natural Resources Conservation Service
EPA-RGI = Regional Geographic Initiative Grant (EPA)
EPA-STAR = 2000-STAR Grant (EPA)

Corps = US Army Corps of Engineers
PCD = Park Conservation District
WPA = DNRC Watershed Planning and Assistance Grant
MSU = Montana State University
GIAC = Geographic Information Analysis Center
BLM = Bureau of Land Management
Ed Grant = Education Grant (DNRC)

APPENDIX E. COLLABORATIONS and PARTNERSHIPS

Partnerships and Contributions

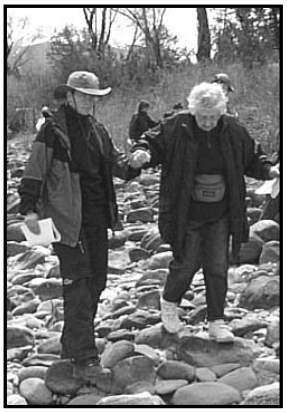


Photo 69. Workshop participants. Photo by E. Galli-Noble.

The Task Force took very seriously their charge to establish partnerships and enhance communication amongst diverse groups concerned about the Yellowstone River. With each successive year, they built stronger relationships with these groups, as well as reaching out to other groups interested in learning more about the upper Yellowstone River effort and large river systems. Numerous other agencies and organizations have been conducting research studies throughout the Yellowstone River Basin, and the Task Force took every opportunity to share technical information with and learn from these entities.

Photo 70. Task Force chair, General Strock, and Corps staff. Photo by E. Galli-Noble.

Task Force Partners—The Task Force structure has illustrated how community-led, private/government collaborations provide an ideal approach to watershed management. Community members were empowered and given an opportunity to be a part of the management of their watershed. Regulatory agencies and academics worked alongside local citizens, helping to guide the process in a scientifically sound and realistic fashion. Local citizens, not directly involved in the Task Force effort, were always encouraged to be involved and to speak up when warranted. Consequently, the 43 recommendations adopted by the Task Force have been scrutinized by local citizens, have community support and by in, and have practical application for regulatory agencies.

Significant contributions have been made by partner agencies within the Task Force structure and those directly involved in the cumulative impact analysis of the Yellowstone River system. Those contributions have been the building blocks for success throughout this project.

Task Force Subcommittees—Given the overwhelming amount of work that was undertaken, and the multitude of decisions brought before them, the Task Force used specially-appointed subcommittees to add extra energy to particularly difficult (contentious) or time-consuming issues. Task Force members, staff, TAC members, and local citizens devoted hundreds of hours in special subcommittee sessions over the past six years. Task Force subcommittees that made significant project contributions include:

- Technical Advisory Committee Selection Subcommittee
- Financial Affairs Subcommittee
- Coordinator Selection Subcommittees (2)
- Educational Workshops/Outreach Subcommittees (3)
- Socio-Economic Assessment Subcommittee
- Cooperative Agreement Subcommittee
- Task Force/TAC Scientific Issues Subcommittees (2)
- Governor's Conference Subcommittee

Upper Yellowstone River Landowners—Upper Yellowstone River landowners are to be praised for their support and cooperation throughout this effort. In addition to donating their time as Task Force members or attending Task Force monthly meetings, more than 700 private landowners have allowed ten Task Force research teams to access their properties to collect data over the past six years. The Task Force could not have accomplished a scientifically based investigation without their support, patience, and trust, and we owe these local citizens great thanks.

Photo 71. Ranch east of Livingston. Photo by E. Galli-Noble.

Full Yellowstone River Cooperation—A notable development in past few years has been the strengthening cooperation between the Task Force and the Yellowstone River Conservation District Council (YRCDC). Over the past three years, both groups have made every attempt to share information and work together to benefit all citizens along the Yellowstone River.

The YRCDC was formed in 1999 with the purpose to provide local leadership, assistance, and guidance for the wise use and conservation of the Yellowstone River's natural resources. In much the same way as the Task Force, the YRCDC is collaborating with the Corps on a cumulative effects assessment of the Yellowstone River. Given that the Task Force has already intensively studied the upper river, the YRCDC is focusing their efforts from Springdale east, on the middle and lower Yellowstone. The Task Force chair, coordinator, and members of the TAC have worked closely with the YRCDC in an effort to ensure that the two river studies complement each other as much as possible and to exchange technical information.

APPENDIX F. OUTREACH and EDUCATION

Landowner Permission

Because the vast majority of land adjoining the upper Yellowstone River is privately owned, the Task Force felt that it was crucial to keep the public constantly informed of their investigations and actions along the river. From 1998 through 2002, hundreds of private landowners were asked to give research teams permission to access their properties. Securing access to collect data was the main purpose for these communications. However, the Task Force coordinator also used the opportunity to inform property owners about specific study objectives and timelines; to educate them about our overall cumulative effects investigation; and as a community outreach effort, which allowed property owners the opportunity to ask questions about the Task Force or comment on the river investigation.

Community Outreach

Educational presentations, workshops, and river tours were an important component of Task Force public outreach. In addition to providing technical information to participants, these events also provided an opportunity for local residents to interact with Task Force members and their research team members. Fostering communication in this way helped to build trust in the local community and allowed interested parties to learn more about each other and to learn from one another.

Educational Presentations

The Task Force was invited to do more than 25 formal presentations on the upper Yellowstone River project from 1998 through 2003. John Bailey and Liz Galli-Noble presented on most of these occasions, as did TAC members and research team leaders on occasion. Presentations were given to the following groups/organizations/events: Federation of Fly Fishers (3), Montana Native Plant Society, NRCS Yellowstone River Public Information Forum, Livingston Business Women, Sleeping Giant Middle School science class, Yellowstone Roundtable, Livingston Rotary Club, Changing Landscapes of Rural America Conference, Yellowstone River Conference, American Fisheries Society, Bozeman's Chief Joseph Middle School, Montana Watershed Coordinator Council, Cumulative Impact Analysis Workshop (Omaha), Cascade County Conservation Council (2), USGS NAWQA Conferences (2000, 2001), Billings Conservation Roundtable, MSU landscape architecture class, Park City Utah Summer 2002 Tour, Great Falls Womens Club, Yellowstone Recreational Boaters Association, Park County Economic Development Corporation, Board of Realtors, and Trout Unlimited Yellowstone River Conservation and Fly Fishing Camp.

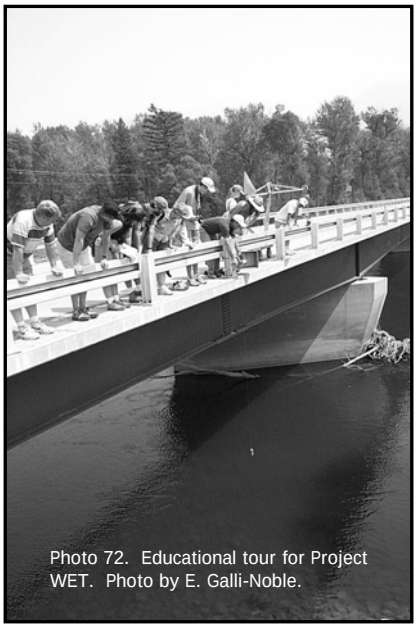


Photo 72. Educational tour for Project WET. Photo by E. Galli-Noble.

Educational Workshops

The Task Force hosted five educational workshops/field trips from 1998 to 2003. Educational workshops provided a platform for invited guest speakers to share their knowledge, experiences, and research data on issues of particular interest to Task Force members and the public. Brief descriptions of Task Force workshops follow.

January 17, 1998, Gravel/Sediment Workshop—The Task Force sponsored their first education workshop in early 1998 to provide information and answer questions concerning Yellowstone River permitting and gravel/sedimentation. The workshop was held on January 17, 1998, from 8:30 am to noon at the Yellowstone Inn in Livingston. Seven agency presenters covered the topic of permitting and three presenters covered the topics of hydrology and geomorphology as they pertain to sedimentation.

October 16, 1998, Yellowstone River Cumulative Effects Study Field Trip—In late 1998, the Task Force hosted an educational field trip to Ninth Street Island and the Sheep Mountain fishing access. The purpose of the field trip was to provide Task Force members and the public an opportunity to discuss topics and methods that had been proposed for the upper Yellowstone River cumulative effects study. A technical work plan for the study was also presented at the event and the public was encouraged to provide feedback on that work plan. The field trip was held on October 16 from 1:00 to 4:00 pm.

May 13, 2000, Wildland Fire Workshop—The Task Force received many requests to focus the first of their 2000 educational workshops on the topic of fire, and specifically the effects of the 1988 fires on the Upper Yellowstone River Basin. In response to that request, they sponsored a wildland fire workshop, while also reviewing basic principles of riverine hydrology and fire/forest ecology. The purpose of the workshop, entitled *Hydrologic Response to the 1988 Fires in the Upper Yellowstone River Basin,* was to improve the knowledge base of local area residents related to issues involving the Upper Yellowstone River Watershed. The Task Force and Park Conservation District worked collaboratively in hosting this event.

The workshop was held on May 13, 2000, from 9:30 am to 3:00 pm at the Lincoln School in Livingston. Six presenters covered the following topics: Forest and Fire Ecology; 1988 Yellowstone Fires; Forest Hydrology, Fires, and Runoff; and Effects of 1988 Fires on Yellowstone River Runoff.

March 3, 2001, Upper Yellowstone River Workshop—As a greater number of research teams entered the field in 2000 and 2001, the Task Force began to receive requests from landowners along the river to better explain the cumulative effects investigation and update them on project progress.

Photo 73. 2001 workshop participants. Photo by E. Galli-Noble.

In response to those requests, the Task Force sponsored a project overview workshop, entitled: *Upper Yellowstone River, What the heck is the Task Force up to*? The Task Force asked all of their research team leaders to come and talk about their studies, and to be available to answer the public's questions. The intent of this workshop was to: (1) give the public a chance to get to know the Task Force and their research teams better, (2) help the public understand why and how scientific studies in the upper Yellowstone were being conducted, and (3) give everyone a chance to get involved in the effort. In addition to presenting detailed information on each of the main research investigations, the TAC chair, Dr. Duncan Patten, also reviewed basic principles of riverine systems or "how rivers work," and explained the interactions between the studies.

The workshop was held on March 3, 2001, from 9:00 am to 3:00 pm at the Yellowstone Inn in Livingston. There were more than 50 participants. The Task Force and MSU Montana Watercourse worked collaboratively in hosting and funding the event.

May 5, 2001, Upper Yellowstone River Demonstration Workshop—Building upon the success of the March 3rd workshop, a follow-up demonstration workshop was held by the Task Force on May 5, 2001. The workshop was held outdoors, at five designated research sites along the river. The purpose of this on-site workshop was to: (1) explain what information the research teams had been collecting in the study area, (2) demonstrate data collection techniques, and (3) answer questions from the public. Presentations were given by Dr. Duncan Patten and six research team leaders (fish studies, riparian vegetation, bird study, geomorphology, and hydrology).

Photo 74. Demonstration workshop. Photo by E. Galli-Noble.

The workshop was an all day event—9:00 am to 3:30 pm—with more than 40 people attending. Once again, the workshop was hosted and funded by the Task Force and MSU Montana Watercourse. Yellowstone National Park also donated the use of their commuter bus in order to transport participants to and from workshop demonstration sites.

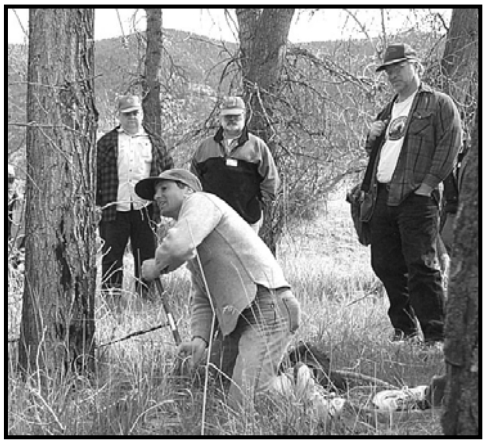


Photo 75. Demonstration workshop.
Photo by E. Galli-Noble.

Yellowstone River Tours

The Task Force hosted ten river tours over the past six years for a wide range of interest groups and agency partners. The Task Force Chair, John Bailey, and other Task Force members donated a great deal of time and energy to make these events informative, visually revealing, and pleasant for their guests. Tour groups included:

Photo 76. River tour with Task Force chair. Photo by E. Galli-Noble.

May 17, 2000—Rocky Mountain Watershed Coordinator's Roundtable
July 6, 2000—Senator Max Baucus and Assistant Secretary Westphal
July 16, 2000—Corps staff Helena and Omaha, and EPA Denver staff
August 16, 2000—Project WET Teachers Tour
September 11, 2000—General Strock/Corps Northwestern Division and Omaha District

June 25, 2001—Corps Omaha and Congressional Office of Budget and Management
August 15, 2001—Socio-Economic Subcommittee and DEQ staff

July 23, 2002—Corps Regulatory Branch, Omaha Office
August 7, 2002—EPA Administrator Christie Todd Whitman and EPA Washington/Denver staff
August 15, 2002—Park City Utah Summer 2002 Tour group

Summer Research Interns

Two Carleton College environmental studies students interned on the upper Yellowstone River project over the summer of 2002. Marc Antinoro and Keith Wolter assisted four Task Force research teams with data collection from June 15 to August 15, 2002. Their enthusiasm and hard work was much appreciated and greatly benefited the overall Task Force effort.

Governor's Conference for the Upper Yellowstone River

Given the enormity and importance of the Upper Yellowstone River Project, Governor Martz and her staff encouraged the Task Force to host an educational conference in the fall of 2003, upon project completion.

Photo 77. Governor Martz and Colonel Ubbelohdel at the Governor's Conference. Photo by M. Gilbert.

The *Governor's Conference for the Upper Yellowstone River* was hosted by the Governor's Office, Governor's Upper Yellowstone River Task Force, and Park Conservation District. It was held at Chico Hot Springs Resort in Paradise Valley from October 20 to October 22, 2003. A total of 138 individuals attended the event over a

three-day period. The event brought together many project partners, both locally and nationally, and helped ensure that the Task Force recommendations and scientific findings were clearly articulated to the public and governmental agencies at all levels. The Task Force does not want their study outcomes to simply be put on a shelf. To the contrary, they want their work to provide the foundation upon which future actions on the Yellowstone River will be based.

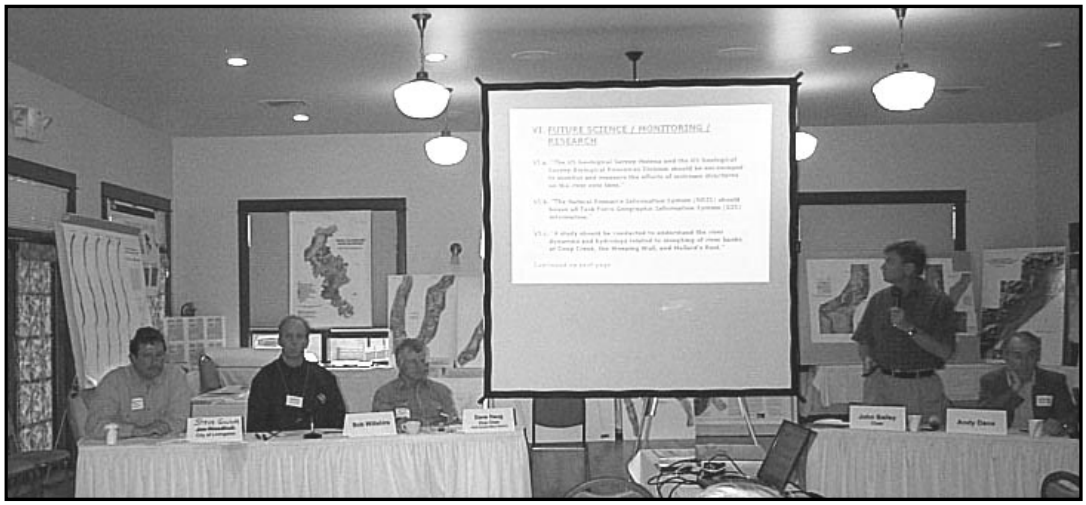


Photo 78. Session 7 at the Governor's Conference. Photo by E. Galli-Noble.

Conference Purpose—The main purpose for the conference was to allow key watershed players (1) to hear the Task Force's 43 final river management recommendations for the upper Yellowstone and to learn how those decisions were made; (2) to hear individual research investigation findings, and see their work products and integrated research results (including cumulative effects analysis); (3) to discuss, analyze, and learn from the policy processes developed and applied by the Task Force; and (4) initiate a dialogue about the long-term management in the Upper Yellowstone River Watershed for local, state, and federal entities.

Conference Objectives/Goals—The overall goals of the conference were achieved. They were to:

1. Present final Task Force river management recommendations to Governor Martz, project partners, and the citizens of Park County.
2. Present final results and work products from eight independent scientific studies and several collaborative mapping efforts to the public and other interested parties.
3. Present integrated scientific data and results from the cumulative effects analysis of the Upper Yellowstone River Watershed.
4. Encourage an exchange of information and experiences among watershed residents, researchers, governmental agencies, and resource professionals.
5. Begin the dialogue:
   *For practical application of Task Force recommendations (on-the-ground projects, adaptive management, follow-up research and monitoring, etc.).
   *For what comes next, post-Task Force. Focal topics included: Special Area Management Plan, Upper Yellowstone Cooperative Agreement Group, TMDL, and Yellowstone River Conservation District Council.

Project Products Showcased—As was stated above, the Task Force research teams presented their findings and work products to conference attendees (Governor, Task Force members, project partners, and members of the public). This was accomplished in several ways:

(1) Each study team did a formal lecture/slide presentation on the second day of the conference.
(2) Research teams explained how independent research efforts were integrated during the four-year river assessment process, and how cumulative effects analysis will be a final product of that integration as well. They showcased several crucial mapping products—preliminary Park County floodplain maps and mosaiced historic aerial photography—which provided the baseline information for all of the Task Force studies; in particular, study design, sampling regimes, temporal and spatial change, and flood elevations were gleaned from these vital mapping products/data layers.
(3) A poster session was conducted for the general public during the evening of October 21; major study findings and all major mapping products were visually displayed (including posters of all nine segments of the preliminary floodplain maps) and research team members were available to answer questions during this session.

Photo 79. TAC members/researchers at the Governor's Conference banquet dinner. Photo by M. Gilbert.

Audience—The targeted audience for this event was varied and broad, as has been the case for all of the Task Force actions. The audience included:

(1) Governor Martz and the Governor's Natural Resource Policy Advisor.
(2) Task Force members/staff and Technical Advisory Committee (TAC) members.
(3) Local landowners, Park County residents/business owners, Montana citizens.
(4) Montana State University personnel, including President Gamble.
(5) Yellowstone River Conservation District Council members/staff/TAC.
(6) Governmental agencies/partners (local, state, and federal).
(7) Interested members of the scientific community.
(8) Other watershed groups.
(9) Non-profit groups (Park County Environmental Council, Yellowstone Forum, Trout Unlimited, Greater Yellowstone Coalition, American Rivers, The Nature Conservancy).
(10) Press: local newspapers, Yellowstone Public Radio.

Timely and intelligible dissemination of relevant information to the public has been an important aspect of the Upper Yellowstone River Project and the development of river management recommendations. This final project conference proved to be the perfect venue for the Task Force to share their final recommendations and the science that those recommendations were based on. Governor Martz lent the prestige of her office to the conference, and she and John Bailey delivered positive and thoughtful opening speeches during the opening banquet on October 20. This set the stage for the conference; the atmosphere of the entire conference was upbeat, informative, and encouraged communication amongst the diverse groups attending.

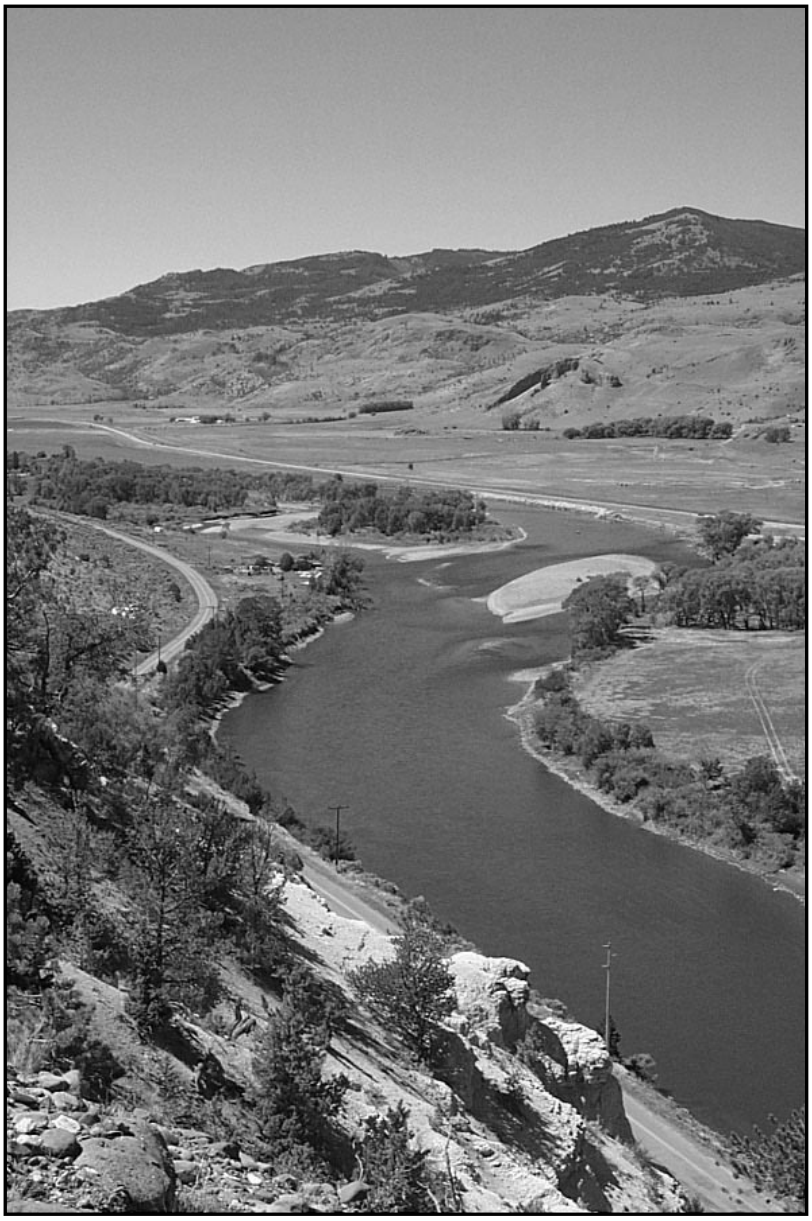


Photo 80. Upper Yellowstone River south of Emigrant. Photo by E. Galli-Noble.